

Message

From: Thomas Carpenter [Carpenter.Thomas@epamail.epa.gov]
Sent: 9/24/2018 4:08:36 PM
CC: Bright, Wanda [Bright.Wanda@epa.gov]; Yeow, Aaron [Yeow.Aaron@epa.gov]; Cunningham, Laticia [Cunningham.Laticia@epa.gov]; Starks, Angela [Starks.Angela@epa.gov]; Brennan, Thomas [Brennan.Thomas@epa.gov]; Carpenter, Thomas [Carpenter.Thomas@epa.gov]
Subject: Meeting Material Request approved for the Web site

The ***Biogenic CO2 Emissions: Dr. Moomaw comments to EPA Science Advisory Board on the proposed accounting of carbon emissions from combustion of forest bioenergy.*** Meeting Material, for the Meeting of the Chartered Science Advisory Board Meeting, for 9/26/2018, has been posted to the SAB Web site at this location:

<https://yosemite.epa.gov/sab/sabproduct.nsf/0/42057C1CB38C7AD5852582F8004F2DE7?OpenDocument&Date=9/26/2018>

The ***Biogenic CO2 Emissions: Dr. Moomaw comments to EPA Science Advisory Board on the proposed accounting of carbon emissions from combustion of forest bioenergy.*** Meeting Material, is also available in the product database:

[Click here to open the Meeting and view the Meeting Material under Meeting Materials](#)

Message

From: Carpenter, Thomas [Carpenter.Thomas@epa.gov]
Sent: 7/2/2018 2:56:50 PM
To: Stallworth, Holly [Stallworth.Holly@epa.gov]
CC: Brennan, Thomas [Brennan.Thomas@epa.gov]; Johnston, Khanna [Johnston.Khanna@epa.gov]
Subject: RE: draft e-mail to Biogenic Carbon Emissions Panel

Thank you for the reminders – it has been two weeks of fire drills and higher profile concerns. Rest assured this is on my radar. Thank you for resending your draft.

Tom C

From: Stallworth, Holly
Sent: Monday, July 02, 2018 10:24 AM
To: Carpenter, Thomas <Carpenter.Thomas@epa.gov>
Subject: FW: draft e-mail to Biogenic Carbon Emissions Panel

Tom,

What's going on with this? I think we owe the Biogenic Carbon Emissions Panel some explanation of what is happening with their report, particularly since receiving Bob Abt's question on June 18.

Holly

From: Stallworth, Holly
Sent: Wednesday, June 27, 2018 1:01 PM
To: Carpenter, Thomas <Carpenter.Thomas@epa.gov>
Subject: draft e-mail to Biogenic Carbon Emissions Panel

This was harder to write than I was expecting. I received feedback from Armitage and Shallal. See what you think. I think it's consistent with what we discussed. I'd like the Panel to receive something soon because we left Bob Abt's question hanging. I've attached the e-mail addresses for your convenience.

DRAFT E-MAIL FROM YOU TO PANEL:

Dear Biogenic Carbon Emissions Panel,

I am writing to you as Designated Federal Officer for the chartered SAB to let you know of the Board's most recent discussion of the Biogenic Carbon Emissions report. As you know, the chartered SAB considered the Panel's June 2017 revised draft (posted at <https://yosemite.epa.gov/sab/sabproduct.nsf/ea5d9a9b55cc319285256cbd005a472e/6cc0c0fa87b00f72852581860059a5eb!OpenDocument>) in its August 29, 2017 meeting and did not approve it for transmittal to the EPA Administrator. The Board had considered an earlier draft of the report on March 31, 2016.

In a recent administrative meeting on May 31, 2018, the chartered SAB approved a decision to have volunteer Board members revise the most recent draft of the Biogenic Carbon Emissions Panel. Board members Steven Hamburg, Jeanne VanBriesen and William Schlesinger are revising the current draft for the Board to consider at its September 2018 meeting. The next draft will be considered a product of the Board. While it will draw upon and acknowledge the Panel's work, you will not be listed as authors. The Panel's June 2017 draft (and all previous drafts, meeting minutes and public comments) will remain preserved and posted on our SAB website.

Once we have the Board's draft and a date set for the Board's next meeting, I will be in touch to let you know of the opportunity to provide comments, both orally and in writing, to the Board. We do not plan to reprise the Panel to comment collectively on the Board's draft but we will welcome your comments as individual scientists on the Board's forthcoming draft. In addition to having the opportunity of submitting written comments, you will have the opportunity of presenting oral comments as well.

We very much appreciate the Panel's work and look forward to hearing your feedback.

Message

From: Johnston, Khanna [Johnston.Khanna@epa.gov]
Sent: 5/9/2018 2:25:33 AM
To: Yeow, Aaron [Yeow.Aaron@epa.gov]; Carpenter, Thomas [Carpenter.Thomas@epa.gov]
CC: Brennan, Thomas [Brennan.Thomas@epa.gov]
Subject: Fwd: RSC Distribution: Tiering - April 2018 Tiering Approval Report

FYI—(cutting and pasting immediately below)

New Tiering:

Lead Office: OAR

Proposed: Tier 2

SAN 6715: Biogenic CO2 Rulemaking

External Abstract: This proposed action will establish regulatory provisions for the treatment (exemption) of certain biogenic carbon dioxide (CO2) emissions from stationary sources under the Prevention of Significant Deterioration (PSD) and Title V permitting programs. The proposed regulatory action will be based on the Agency's policy regarding the treatment of biogenic CO2 emissions under the Clean Air Act.

Action Document Link->Notes Link

RSC Representative: Tom Eagles OAR/OAA ([202-564-1952](tel:202-564-1952))

Khanna Johnston I Deputy Director I Science Advisory Board I 1200 Pennsylvania Ave. N.W. I Washington DC 20460 I 202.564.2820

Begin forwarded message:

From: "Adams, Darryl" <Adams.Darryl@epa.gov>
Date: May 8, 2018 at 3:33:38 PM EDT
To: RSC Core <RSC_Core@epa.gov>, RSC Regions Core <RSC_Regions_Core@epa.gov>, OCSPP Tiering <OCSPP_Tiering@epa.gov>
Cc: "Lamson, Amy" <Lamson.Amy@epa.gov>, "Nickerson, William" <Nickerson.William@epa.gov>
Subject: RSC Distribution: Tiering - April 2018 Tiering Approval Report

New Tiering:

Lead Office: OAR

Proposed: Tier 2

SAN 6715: Biogenic CO2 Rulemaking

External Abstract: This proposed action will establish regulatory provisions for the treatment (exemption) of certain biogenic carbon dioxide (CO2) emissions from stationary sources under the Prevention of Significant Deterioration (PSD) and Title V permitting programs. The proposed regulatory action will be based on the Agency's policy regarding the treatment of biogenic CO2 emissions under the Clean Air Act.

Action Document Link->Notes Link

RSC Representative: Tom Eagles OAR/OAA (202-564-1952)

Outline SAB Report on Biogenic Carbon Questions

1. Executive Summary

Revise based on new content and connections throughout

2. Introduction. This chapter will provide context for the report from the panel as well as the challenges offered by multiple SAB reviewers.

Add text on the following topics.

- a. Background and Charge to the SAB (2011 and 2014 Framework reports and SAB prior advice)
- b. Global carbon cycling and climate change.
- c. BAF temporal and spatial questions
- d. BAF emissions vs stock analyses
- e. Model uncertainty and limitations
- f. Separating the Science and Policy Questions and defining a policy context

3. Overarching Comments.

Revise to link these comments to the context discussion added to the introduction and to refer to appendices more fully when content in chapter 4 is moved there.

4. Responses to EPA's Charge Questions.

Revise text to link the responses to the context discussion and the overarching comments.

Revise text to more fully link the responses to the 2011 and 2014 Framework documents so as to support sufficient background that the document can be 'stand alone' in terms of advancing understanding on the topic.

Add relevant and visually clear figures to support the links between the responses and the fundamental overview content added to Chapter 2.

Add text to weave alternative discussion from the SAB reviewers into the report as relevant

Remove responses to charge questions that SAB reviewers indicated could not be answered or should not be answered. It is acceptable for SAB to say the charge question as framed is insufficiently clear to allow a consensus response. Responses that the panel made to these charge questions can be provided in an appendix, if it is made clear that these appendices do not represent SAB consensus. [Do we have a procedure for doing that with minority reports already?]

Remove (move to appendix) newly developed approaches that are novel to this report.

5. Conclusions and Next Steps. This chapter will provide a path forward for the agency to advance understanding of the unsettled science and provide clarity needed for their decision-making.

Add text on the following topics.

- a. Science-related charge questions that require additional research
- b. Policy-related charge questions that require revision to focus on science questions.
- c. Science-informed decision EPA must make to advance policy-making with respect to biogenic carbon

6. References.

Add significantly to this list based on the text additions that will be made in Chapter 2.

7. Appendices.

Add material removed from Chapter 4 to the relevant appendices.

Preface to the Working Group Charge or to the New Chapter in the SAB Report

The role of the Science Advisory Board is to advise the agency on questions of science and to provide recommendations based on the best available science. The SAB undertakes studies in response to requests from the agency to assess the state of science on questions where extensive information and analysis may exist, but scientific consensus may not exist, or where such consensus may not have been articulated clearly in the available scientific literature. Thus, the SAB is often tasked with considering contradictory information where multiple disparate conclusions can be reached by different scientists, due to different methods to interpret the information, or different assumptions about initial conditions, or different weighting of the relevant controlling parameters in conceptual or computational models. This challenge is not new, and although it is increasingly difficult, is it the responsibility of the SAB to provide this important integrative, evaluative analysis to the agency.

When questions of science are not settled, and multiple scientists disagree on the conclusions to be drawn from available information, the SAB is obligated to present this clearly, with attention to the case to be made for multiple perspectives, and the limitations of available information to distinguish between competing explanations for observed phenomena. It is not easy for the SAB to say “science does not know,” but it is imperative that where science is insufficient, this limitation is acknowledged. Increasingly, decision-making requires attention to just such uncertainties, and the SAB should provide advice on how to advance the science necessary to answer EPA’s questions when such science does not currently exist. Further, SAB should regularly remind the agency that quantifying uncertainty of the type often observed in scientific analysis, and using this quantification to inform decision-making, is a science itself, and its best practices should be applied throughout agency activities.

What the SAB is NOT tasked with is analysis of the regulatory or policy choices that are made by the agency in response to the scientific analysis. Increasingly, such choices are becoming entwined with questions of science in ways that obscure rather than enlighten. Further, in many questions that come before the SAB, the effect of human choices (from infrastructure construction to policy implementation) are the driver for the scientific question. These choices represent the reason we seek to understand the science. This interplay of the human-driven choice that requires scientific input, with the actual science that could be relevant to that choice, can obscure differences between what can be known from science and what must be assumed about human choices.

The SAB review of science on the issue of biogenic carbon accounting methods suffered from all these complexities and demonstrated the significant challenges that face the agency on this issue and are likely to face it on many more. In this introductory chapter, the SAB will disentangle these issues, providing context for the report from the panel as well as the challenges offered by multiple SAB reviewers. In the final chapter of the report, a path forward for the agency to advance understanding of the unsettled science and provide clarity needed for their decision-making will be presented.

Message

From: Carpenter, Thomas [Carpenter.Thomas@epa.gov]
Sent: 5/23/2018 10:31:40 PM
To: Michael Honeycutt [Michael.honeycutt@tceq.texas.gov]
CC: Brennan, Thomas [Brennan.Thomas@epa.gov]
Subject: FW: SAB biogenic carbon emission report.

FYI – Biogenic emissions report progress for the admin meeting.

From: Jeanne VanBriesen [mailto:jeanne@cmu.edu]
Sent: Wednesday, May 23, 2018 2:40 PM
To: Steven Hamburg <shamburg@edf.org>; Carpenter, Thomas <Carpenter.Thomas@epa.gov>
Subject: RE: SAB biogenic carbon emission report.

Hi Steve:

I like your changes in red below. I also concur on the two points – swap the order on 2c and 2d and make this content general rather than specific to the BAF issue. I also strongly support your conclusion that the current document is inadequate in its treatment of the fundamental science related to carbon accounting in bioenergy. Adding this important information will assist the reader in following the challenges related to the specific framework EPA proposes and the panel modified.

I am stacked tomorrow, and I think you (Steve) were not available Friday. Do we want to try to chat next Tuesday?

jeanne

From: Steven Hamburg <shamburg@edf.org>
Sent: Wednesday, May 23, 2018 10:47 AM
To: Carpenter, Thomas <Carpenter.Thomas@epa.gov>; Jeanne VanBriesen <jeanne@cmu.edu>
Subject: RE: SAB biogenic carbon emission report.

Tom

Sorry for the delay. The note below looks good to me, I suggested a couple of modest edits (noted in red) to try to not convey an impression that only a few tweaks are required. While we all agree there is a lot that can be carried forward from the subcommittee report the framing will require some reworking to ensure that the messages are clear, science-based and broadly applicable. The current document is very ineffective in conveying the science related to carbon accounting of bioenergy, in part because of the writing but also due to the fact that it conflates general issues with those issues specific to the proposed EPA framework. The reader is not well equipped to effectively deconstruct these factors – in turn that undermines the utility of the report. I believe we can restructure and simplify the report without a lot of new work added.

Along those same lines the outline looks fine to me. I have a couple of modest, but I think important, changes to suggest:

- Reverse the order of 2 c and d
- Remove reference to BAF in 2c and 2d. This is important as the issues are not unique to the EPA framing using BAF and as such the discussion should deal with the broader science issues, as much of the text already does, and then address the BAF related issues.

Let me know if you have any questions.

Cheers

Steve

From: Carpenter, Thomas <Carpenter.Thomas@epa.gov>
Sent: May 20, 2018 1:48 PM
To: Steven Hamburg <shamburg@edf.org>; jeanne@cmu.edu
Subject: SAB biogenic carbon emission report.

Hello Steve and Jeanne

I attached an annotated outline for your reviews. I also attached a blurb to tee up the discussion at the Administrative meeting next week. Please take a look and let me know if you have any comments.

Jeanne had some times this week we might be able to have a call. Steve let me know if these work for you – if they don't we can iterate through email. Thank you.

Tom

Finalizing the Biogenic Carbon Dioxide Emissions for Stationary Sources Report.

At the last SAB meeting (August 30, 2017) the Board expressed concerns during the second quality review of the Biogenic Carbon Emissions Panel's draft report (6/2/17) *SAB review of Framework for Assessing Biogenic CO2 Emissions from Stationary Sources (2014)* on a key recommendation regarding the time frame to develop a biogenic assessment factor (BAF). The Board noted that during the first quality review (March 31, 2016) the Board identified several issues and sent the draft back to the Biogenic Carbon Emissions Panel for revision. The Board found the Panel's revised draft report contains some revisions to address the Board's concerns. However, in particular the Panel's recommendations to develop the BAF remained an issue.

At the August 30, 2017 meeting revised language developed by the Chair and lead reviewers in the letter to the Administrator and Executive Summary to reach a consensus draft was presented to the chartered SAB. SAB members discussed several possible options to finalize the draft report and opted for the chartered SAB to finalize the report using portions of the draft report and augmenting sections to clarify the status of the science and options to developing a BAF not presented in the draft report.

Several key project members of the SAB, including Chairs and lead reviewers, and the Biogenic Carbon Emissions Panel have completed their terms of service. The remaining lead reviewers have discussed a proposed outline for a final report with SAB Staff Office personnel and identified additional SAB members to participate in finalizing this report. Attached is an annotated outline and chronology of the SAB's efforts. Attachment G and H respectively)

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Message

From: Standifer, Juanita [Standifer.Juanita@epa.gov]
Sent: 2/3/2020 8:51:18 PM
To: Brennan, Thomas [Brennan.Thomas@epa.gov]; Johnston, Khanna [Johnston.Khanna@epa.gov]
Subject: RE: EPM_Science Advisory Board_Merged_OMB_epa resp

Thank you, Tom. No worries. This is great! Will share it with OCFO.

Juanita Standifer

Acting Assistant Director
Resource Management Staff (RMS)
Office of Administrative and Executive Services (OAES)
Office of the Administrator (AO)

US Environmental Protection Agency (US EPA)
1200 Pennsylvania Avenue, NW (Mailcode: 1104A)
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Off (202) 566-2764 ~ Cell (202) 657-3533
Fax (202) 566-0968

From: Brennan, Thomas <Brennan.Thomas@epa.gov>
Sent: Monday, February 03, 2020 3:48 PM
To: Standifer, Juanita <Standifer.Juanita@epa.gov>; Johnston, Khanna <Johnston.Khanna@epa.gov>
Subject: RE: EPM_Science Advisory Board_Merged_OMB_epa resp

Revised paragraph:

Narrative: In FY 2019, the SAB produced 2 consultations and 3 scientific peer reviews while CASAC produced 1 consultations, and 1 scientific peer reviews. SAB topics included a review of assessments of IRIS chemicals and a review of biogenic carbon emissions from stationary sources. The CASAC work was a review of the PM Integrated Science Assessment and a consultation of the ozone Integrated Review Plan. In FY 2019, EPA organized a Lean event focusing on improving efficiency and effectiveness through a proposed cross-cutting measure. The SAB proposed a seven percent reduction in the time it takes to develop reports and proposed to post Federal Advisory Committee Act (FACA) meeting minutes 90 days after the meeting. These actions are intended to increase transparency and public participation.

- *Note – I am not sure why its says “10” the actual number is “7”. Apologies for that error.*

Tom Brennan
Director, Science Advisory Board Staff Office
US Environmental Protection Agency

Desk # 202 564 6953
Mobile # 703 581 9300

From: Standifer, Juanita <Standifer.Juanita@epa.gov>

Sent: Monday, February 03, 2020 2:51 PM

To: Brennan, Thomas <Brennan.Thomas@epa.gov>; Johnston, Khanna <Johnston.Khanna@epa.gov>

Subject: EPM_Science Advisory Board_Merged_OMB_epa resp

Hi Tom and Khanna,

OMB has asked us to rephrase the following paragraph in the SAB narrative. Can you please review and revise to address their comments? Thank you.

OMB Comment: Can you rephrase this first part? It's unclear whether this includes the number of SAB peer reviews. Please consider adding in the number of peer reviews the SAB accomplished, as the FY 2021 section below numbers how many peer reviews they plan to accomplish.

Narrative: In FY 2019, the SAB and CASAC produced 10 advisory reports, consultations, and/or commentaries from independent, scientific peer reviews providing scientific and technical advice on topics including risk exposure and integrated science assessments, health and ecological criteria, and toxicological and regulatory reviews. In FY 2019, EPA organized a Lean event focusing on improving efficiency and effectiveness through a proposed cross-cutting measure. The SAB proposed a seven percent reduction in the time it takes to develop reports and proposed to post Federal Advisory Committee Act (FACA) meeting minutes 90 days after the meeting. These actions are intended to increase transparency and public participation.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

April 19, 2019

THE ADMINISTRATOR

Dr. Michael Honeycutt
Chair, Science Advisory Board
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

RE: SAB Discussions about EPA Planned Actions in the Fall 2017 Unified Agenda, Spring 2017 Unified Agenda, "Strengthening Transparency in Regulatory Science" and its Supporting Science; and Review of EPA's report titled *Screening Methodologies to Support Risk and Technology Review (RTR): A Case Study Approach and Framework for Assessing Biogenic CO2 Emissions from Stationary Sources* (2014)

Dear Dr. Honeycutt and Members of the Board:

The U.S. Environmental Protection Agency recognizes the important role the Science Advisory Board plays in helping the EPA fulfill its mission to protect human health and the environment. This letter responds to several communications from the SAB during the past several months. I understand that following public meetings in 2018, the board expressed an interest in reviewing several recent, pending and future regulations from the EPA.¹

I welcome your interest in these matters and appreciate your desire to advise me in this regard. This letter is intended to provide further information regarding the regulatory matters in which you have expressed interest (including updates as to their respective status), important context regarding the role of the SAB and the EPA in regulatory matters and questions with regard to which I would appreciate your scientific advice and comments.

The Board has expressed an interest in six critical regulatory matters, five of which were selected from the Spring 2017 and Fall 2017 Unified Agendas of Federal Regulatory and

¹ These include five regulatory matters in the Office of Air and Radiation: Reconsideration of Final Determination; Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light Duty Vehicles; Repeal of Emission Requirements for Glider Vehicles, Glider Engines and Glider Kits; Review of the 2016 Oil and Gas New Source Performance Standards for New, Reconstructed and Modified Sources; Review of the Clean Power Plan; and Review of the Standards of Performance for Greenhouse Gas Emissions from New, Modified and Reconstructed Stationary Sources: Electric Generating Units. The sixth regulatory matter, Strengthening Transparency in Regulatory Science, was proposed by the Office of the Administrator.

Deregulatory Actions, published in July and December 2017, respectively. These agendas are issued by the Office of Information and Regulatory Affairs based on information provided by the EPA semiannually, and they provide a snapshot of the agency's intended actions. Understandably, the descriptions and status of these matters as provided in the 2017 agendas are no longer current.

This letter includes updated information on the corresponding regulatory matters as detailed in the more recent 2018 Unified Agendas of Federal Regulatory and Deregulatory Action, as well as important context about the status of these rulemakings and whether they include influential scientific information or highly influential scientific assessments appropriate for peer review by the SAB. As you know, the EPA has provided much of this information to the SAB Work Group on EPA Planned Actions for SAB Considerations of the Underlying Science, including in mid-September 2018 for the Spring 2018 agenda and in late 2018 and early 2019 for the Fall 2018 agenda.

The current process for prioritizing regulatory topics for scientific advice has been conducted through engagement among EPA programs, the SAB Staff Office and the SAB Work Group and has focused on previously issued semiannual regulatory agendas. This process is based on the 2012 EPA memorandum, *Identifying EPA Planned Actions for Science Advisory Board (SAB) Consideration of the Underlying Science - Semi-annual Process* and the Office of Policy's 2015 guide, *Process and Best Practices for EPA Engagement with the Science Advisory Board in SAB Screening of the Scientific Basis for Major Agency Planned Actions*. However, several deficiencies in this process, including many raised by SAB members, have come to my attention.

To address these issues, the EPA will update the process by which we engage with the SAB on regulatory science matters. I am asking the Office of Policy, in consultation with the Office of General Counsel, to strengthen the following principles inside the EPA's regulatory development process:

- **Timeliness and Early Notification.** Moving forward, the EPA will ensure that there is early engagement between the EPA and the full Science Advisory Board, including more rapid and frequent briefings to the SAB on major proposed regulations shortly after their release. This will also include other opportunities to regularly keep the board apprised of other ways in which the EPA tracks peer review of influential regulatory science, including the agency's Peer Review Agenda.
- **Transparency and Consistency.** It also seems evident that a more transparent and productive process would entail more early engagement on key regulatory science issues with both the public and the full SAB. In addition, the more detailed templates prepared for a subset of SAB members on the work group duplicate other agency efforts to provide information on the status of major regulations and increase the likelihood of inconsistency. Therefore, we will now offer a briefing to the full SAB following the publication of proposed criteria documents, standards, limitations or regulations that have undergone interagency review pursuant to Executive Order

12866 (including relevant scientific and technical information available to the public on which the proposed action is based).

- **Inter-Committee Coordination.** I am also asking the various EPA program offices and the SAB to work to ensure that the process for seeking scientific advice, and for establishing the scope of that advice on particular regulatory actions, properly takes account of the full suite of important EPA advisory committees. For example, the EPA Clean Air Act Advisory Committee has been chartered to provide advice and recommendations on: approaches for new and expanded programs, including those using innovative technologies and policy mechanisms to achieve environmental improvements; the potential health, environmental and economic effects of Clean Air Act programs on the public, the regulated community, state and local governments and other federal agencies; the policy and technical contents of proposed major EPA rulemaking and guidance required by the act to help effectively incorporate appropriate outside advice and information; and the integration of existing policies, regulations, standards, guidelines and procedures into programs for implementing requirements of the act. To that end, several of the proposed regulatory actions from the Spring and Fall 2017 agendas identified as being of interest to the SAB have already been the subject of briefings during the most recent CAAAC meetings.

Incorporating these principles into the process is consistent with and provides greater support to the vital role the SAB is expected to play in providing scientific advice to the agency. The SAB provides advice as requested by the EPA Administrator, and I believe it is critical for the EPA to clearly establish the scope and timing for such scientific advice. Further, ensuring that reviews are coordinated through the proper committees also helps to provide an important delineation between scientific advice and policy judgment. The SAB Staff Office Handbook acknowledges this, noting that “[t]he SAB may comment on the policy implications of scientific analyses but should not ‘cross the line’ into policy recommendations.”² The policy decisions that I and other EPA officials are responsible for making are *informed* by scientific considerations, including, where appropriate, advice from the SAB and other advisory bodies.³ But, ultimately, in exercising the authority given to us by Congress, the EPA must take account of a wide range of considerations if the judgments we make and the actions we take within the proper range of that authority are to be reasonable, defensible and consistent with our responsibilities to the American people.

² *Serving on the EPA Science Advisory Board: A Handbook for Members and Consultants* (March 2012), at 10.

³ This emphasis on the SAB’s scientific advice, as well as its role as an input in the regulatory development process, has also been noted by federal courts. See *American Petroleum Institute v. Costle*, 665 F.2d 1176, 1187-88 (D.C. Cir. 1981) (“SAB approval is not required before proceeding to the final stage of rulemaking. . . . ‘The Science Advisory Board is intended to be advisory only. The Administrator will still have the responsibility for making the decisions required of him by law. The reviews and comments of the Board are to be provided to the Administrator for his use’”) (quoting Conference Report, H.R. Rep. No. 95-722, 95th Cong., 1st Sess. 16 (1977), reprinted at 1977 U.S.C.C.A.N. 3283, 3295. It goes without saying that “SAB approval is not required before proceeding to the final stage of rulemaking.” *Id.*

As for the aforementioned topics of interest identified by the SAB, provided below is an update on the status of these actions, along with requests for engagement in 2019:

- The proposed regulation, *Strengthening Transparency in Regulatory Science*, 83 Fed. Reg. 18,768 (Apr. 30, 2018), provides that the EPA will ensure that the regulatory science underlying its actions is publicly available in a manner sufficient for independent validation. The comment period for the proposed rule was open from April 30, 2018, to August 16, 2018. A public hearing for the proposed rule was held on July 17, 2018, in Washington, D.C.

The proposal notes the “challenges and opportunities for facilitating secure access to confidential data for non-government analysts,” and that “mechanisms [for such access] may range from deposition in public data repositories, consistent with requirements for many scientific journals, to, for certain types of information, controlled access in federal research data centers that facilitate secondary research use by the public.” *Id.* at 18,771 (footnotes omitted). The proposal contemplates that the “EPA should collaborate with other federal agencies to identify strategies to protect confidential and private information in any circumstance in which it is making information publicly available.” The EPA would benefit from an SAB consultation on existing mechanisms for secure access to confidential business information and personally identifiable information as discussed in the proposal.

- In its recent communications to the Office of the Administrator, the SAB expressed interest in assessing whether methodologies and assumptions in the EPA’s regulatory impact analyses warrant further review. As the board noted, the EPA sought comment on an Advanced Notice of Proposed Rulemaking on *Increasing Consistency, Reliability and Transparency in the Rulemaking Process* (RIN 2010-AA12) through August 13, 2018. The EPA is in the process of reviewing the public comments received. Subsequent actions as well as updates to the EPA’s Guidelines for Preparing Economic Analysis and the development of a Computable General Equilibrium model for evaluating costs, benefits and economic impacts in regulatory analyses may provide better opportunities for the board to review the technical aspects of these analyses and methodologies. Regulatory impact analyses or regulatory flexibility analyses subject to interagency review under Executive Order 12866 are exempted from peer review requirements under the Office of Management and Budget’s Peer Review Bulletin and the EPA’s Peer Review Handbook.⁴
- The Board also nominated the *Review of the 2016 Oil and Gas New Source Performance Standards for New, Reconstructed and Modified Sources* (RIN 2060-AT54) as a rulemaking potentially meriting further review. The EPA believes that neither *Review of the 2016 Oil and Gas New Source Performance Standards for New, Reconstructed and Modified Sources* (RIN 2060-AT90), nor *Oil and Natural Gas Sector: Emission Standards for New, Reconstructed and Modified Sources Reconsideration* (RIN 2060-AT54) warrant review by the SAB. As noted in the April 4, 2017, notice announcing review of the 2016 action, the agency “will reevaluate whether this Rule or alternative approaches are appropriately grounded in EPA’s statutory authority and consistent with the rule of law.” On September 11, 2018, the EPA proposed

⁴ https://www.epa.gov/sites/production/files/2016-03/documents/epa_peer_review_handbook_4th_edition.pdf.

targeted improvements to the 2016 New Source Performance Standards for the oil and gas industry to streamline implementation, reduce duplicative EPA and state requirements and significantly decrease unnecessary burdens on domestic energy producers. The EPA held a public hearing on the proposed rule on November 14, 2018, in Denver, Colorado. The public comment period on this proposal closed December 17, 2018. Consistent with CAAAC's chartered objective to provide advice, information and recommendations on policy and technical issues associated with implementation of the Clean Air Act, the EPA Office of Air and Radiation provided a briefing on these actions and responded to questions during the September 2018 CAAAC meeting.

The EPA continues to consider broad policy issues in the 2016 rule, including the regulation of greenhouse gases in the oil and natural gas sector. These issues will be addressed in a separate proposal at a later date. OAR is available to brief the board on the upcoming timeline for this regulatory action and address any questions on its review of information.

- The SAB also expressed an interest in the *Review of the Clean Power Plan* (RIN 2060-AT55) being submitted for further review. The EPA has taken a number of regulatory steps related to repealing or replacing the Clean Power Plan, and forthcoming final actions would not benefit from SAB review. To the extent that the agency is also considering a final action, the EPA does not anticipate using any information that would be considered influential scientific information or highly influential scientific assessments. Consistent with CAAAC's chartered objective to provide advice, information and recommendations on policy and technical issues associated with implementation of the Clean Air Act, OAR provided a briefing on these actions and responded to questions during the September 2018 CAAAC meeting.

In October 2017, the EPA proposed to repeal the Clean Power Plan because it exceeded the EPA's authority. The comment period closed April 26, 2018. The EPA held a public hearing from November 28-29, 2017, in Charleston, West Virginia, and listening sessions in Kansas City, Missouri, San Francisco, California, and Gillette, Wyoming.

In December 2017, the EPA issued an Advance Notice of Proposed Rulemaking to solicit information from the public about a potential future rulemaking to limit greenhouse gas emissions from existing electric utility generating units. The comment period ended February 26, 2018.

On August 21, 2018, the EPA proposed the Affordable Clean Energy rule, which would establish emission guidelines for states to develop plans to address greenhouse gas emissions from existing coal-fired power plants. The ACE rule would replace the 2015 Clean Power Plan, which the EPA has proposed to repeal because it exceeded the EPA's authority. The Clean Power Plan was stayed by the U.S. Supreme Court and has never gone into effect. The comment period for the ACE proposal ended on October 31, 2018. The EPA received approximately 500,000 comments on the proposal. The EPA intends to take final action in the second quarter of 2019.

- The Board also suggested reviewing *Review of the Standards of Performance for Greenhouse Gas Emissions from New, Modified and Reconstructed Stationary Sources: Electric Generating Units* (RIN 2060-AT56) from the Spring 2017 Unified Agenda. On December 6, 2018, the EPA proposed to revise the New Source Performance Standards for greenhouse gas emissions from new, modified and reconstructed fossil fuel-fired power plants. After further analysis and review, the EPA proposes to determine that the best system of emission reduction for newly constructed coal-fired units is the most efficient demonstrated steam cycle in combination with the best operating practices. The EPA held a public hearing on the proposal on February 14, 2019, and the public comment period on the proposal will be open through March 18, 2019. OAR could brief the SAB on this action and its relationship to RIN 2060 AT-55 along with the timeline for rulemaking scheduled for these actions. Consistent with CAAAC's chartered objective to provide advice, information and recommendations on policy and technical issues associated with implementation of the Clean Air Act, OAR intends to engage with CAAAC on this action.
- In its letter on the Fall 2017 regulatory agenda, the SAB recommended that the *Reconsideration of Final Determination: Mid Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022-2025 Light Duty Vehicles* (RIN 2060-AT77) be submitted for further review. This reconsideration was completed and published in the *Federal Register* on April 13, 2018 (83 FR 16077). In August 2018, the EPA and the National Highway Traffic Safety Administration proposed the Safer Affordable Fuel-Efficient Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks. The comment period ended on October 26, 2018, and the EPA and NHTSA held public hearings in Fresno, California, Dearborn, Michigan, and Pittsburgh, Pennsylvania.

OAR has been engaging with the SAB Work Group on this regulatory action. OAR presented to the CAAAC at its September 2018 meeting on the proposed SAFE rule consistent with CAAAC's chartered objective to provide advice, information and recommendations on policy and technical issues associated with implementation of the Clean Air Act. OAR answered CAAAC member questions and provided further clarification on this action. The EPA believes that CAAAC and its Mobile Sources Technical Review Subcommittee would be more appropriate venues for any future necessary advice on these actions.

- The Board also recommended for review the proposed *Repeal of Emission Requirements for Glider Vehicles, Glider Engines and Glider Kits* (RIN 2060-AT79). In November 2017, the EPA published a proposal to repeal application of the 2016 Heavy-Duty Phase 2 Rule to gliders, glider engines and glider kits. The proposed repeal is premised on an interpretation of the Clean Air Act under which gliders would be found not to constitute "new motor vehicles" or "new motor vehicle engines" under the CAA. The comment period on the proposal ended on January 5, 2018. On July 6, 2018, the EPA issued a "Conditional No Action Assurance" for certain small manufacturers and their suppliers on the basis of avoiding profound disruptions to small manufacturers in the glider industry while the EPA completes a rulemaking on gliders, with a duration of no longer than one year. On July 26, 2018, the EPA withdrew the no action assurance and explained that the EPA will continue to pursue a rulemaking for gliders. The EPA is in the process of evaluating options to revise requirements applicable to glider vehicles

in a manner that ensures consistency with statutory requirements. The agency expects that any action it may choose to take with respect to this matter would be based on legal and policy grounds and that the CAAAC and its Mobile Sources Technical Review Subcommittee would be more appropriate venues for advice.

- I would also to thank you and all the members of the SAB Risk and Technology Review Methods Review Panel for your comments on the U.S. Environmental Protection Agency's draft document titled, *Screening Methodologies to Support Risk and Technology Reviews (RTR): A Case Study Analysis (May 2017)*. My staff and I appreciate the detailed review and advice provided by the SAB during the public meeting on June 29 and 30, 2017, the public teleconference on December 5, 2017, the public meeting on May 31, 2018, and in your final report dated September 13, 2018. We will review the report and consider each of the recommendations as we continue to update and enhance our risk assessment methods for risk and technology rulemakings.
- The EPA is also appreciative of the efforts of the Board and the Biogenic Carbon Emissions Panel following completion of its second peer review of the EPA's 2014 draft *Framework for Assessing Biogenic Carbon Dioxide for Stationary Sources* with final recommendations communicated on March 6, 2019. As the EPA reviews the SAB's final recommendations, we will consider them in light of the FY2018 Consolidated Appropriations Act, the agency's April 2018 statement regarding the treatment of biogenic carbon dioxide emissions from the use of biomass from managed forests, as well as the November 2018 interagency letter to Congress from the EPA, the U.S. Department of Agriculture and the U.S. Department of Energy, which describes the agencies' work to ensure consistent federal policy on biomass energy. We acknowledge the hard work and dedication of the Biogenic Carbon Emissions Panel and the Chartered SAB and thank them for their recommendations supporting the EPA's technical work on this important topic.

Finally, the EPA will soon be initiating feedback from the SAB on a number of issues not raised in the SAB's letters. Besides our need for recommendations on existing mechanisms for data access as necessary to implement the *Strengthening Transparency in Regulatory Science* rule, the agency anticipates asking for SAB advice regarding upcoming actions related to an update to the 2005 EPA *Guidelines for Carcinogen Risk Assessment*, creation of a guidelines for non-cancer risk assessment and specific advice on improving agency risk communication.⁵ These opportunities are in addition to ongoing and recent advisory activities by the SAB related to the All-Ages Lead Model, efforts to update Environmental Radiation Protection Standards for Nuclear Power Operations (40 CFR part 190), IRIS Assessments for Ethyl Tertiary Butyl Ether and tert-Butyl Alcohol, Scientific and Technological Achievement Awards and Guidelines for Devising Numerical Water Quality Criteria to Protect Aquatic Life.


As projects are developed and ready for review, the SAB Staff Office, in conjunction with the appropriate program offices, will develop a project description and list of charge questions for

⁵ EPA recently formed an agency-wide Risk Communications Work Group in order to elevate and clarify how EPA communicates about risk. This is a top priority for the Administrator, and this effort may present opportunities for additional engagement with the Board.

delivery to the SAB. The first of these requests will be provided to the SAB prior to its next face-to-face meeting.

I appreciate the Board's work in support of the EPA's activities. As always, we would be pleased to work with the SAB Staff Office to schedule an informational briefing on any of these topics. I look forward to continuing to work with you and the board to achieve our shared goals of maintaining transparency, scientific integrity and certainty in the EPA's work.

Sincerely,



Andrew R. Wheeler

Lead Reviewer Comments on the Biogenic Carbon Emissions Report Revisions

- 1) I find the revised report unresponsive to the issues raised by the SAB. While the report brings forward an accounting framework that would allow the selection of a time frame to be made by policymakers, it does so without retreating from their earlier prescriptive framing. The result is increased confusion and co-mingling of solid science and policy proscriptive pronouncements/framing. Given that the accounting for biogenic greenhouse gas emissions is heavily influenced by the temporal dimension and there is no scientific basis for selecting one time frame over another independent of a clear statement of the desired goal, the revised report provides little insight into the fundamental science central to the issues being addressed. The report is written as if the only greenhouse gas accounting being done with respect to greenhouse gas emissions across the economy is from biogenic emissions, yet that is certainly not the case. This is relevant as central to the usefulness of the report is being able to use the science in the context of the larger set of questions being addressed relative to greenhouse gas emissions from a diversity of sources. The temporal considerations vary across these other greenhouse gas emission sources/decisions as well. If one extends the logic in the report to the treatment of time and assumptions of equilibrium to all emissions sources it leads to illogical conclusions. This variation is evident even among biogenic feedstocks, with mill residues having a very different temporal dimension than southern forest harvesting residues and again different from residues in the northwest where standard practices is to burn a lot of this material. Bottom line I do not think the current report advances our understanding of the fundamental science and in fact confuses things to a degree that I could not support approving the report. I do not know the options for how to move forward, but this revised draft falls well short of addressing the concerns the SAB raised the better part of a year ago with the subcommittee.
- 2) As noted in my comments on the report from last week, I was concerned that the updates to the Biogenic Carbon report would not satisfy at least some people on the SAB.

During our group call, we had all discussed edits that would emphasize that a BAF could be assessed at any time period t , and that the BAF would differ depending on the selected time period. As noted by Bill below, this implies (in general) that biogenic carbon can be a net source of CO₂ in the short run and potentially neutral in the long-run. Within that context, one could also note that “long run” BAFs that capture all (or most) positive and negative effects would likely be most relevant for long-run climate changes, but that “shorter-run” BAFs could be relevant for other purposes (or something like that – as you know I’m not a climate expert).

I’m not as concerned about this issue as others on the SAB, and am more amenable to the approach taken by the panel. Nonetheless, as Bill notes below, the updated report does still retain aspects that are likely to be objectionable to some on the SAB. For example, the report still strongly argues that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. It seems as if the panel is fairly adamant about supporting this “long run” BAF—and this is the very issue that is a problem for others on the SAB. I’m not sure how to get beyond this impasse.

I’ve viewed my primary role in this quality review as trying to find some compromise or middle-ground that will satisfy both the panel and others on the SAB, and I’m still hopeful that this can be achieved. But I’m not sure the best way forward from here.

- 3) I am most unhappy with the current, revised version of the Biogenic Carbon Report. There have been some “band-aid” fixes to the earlier version, but this revision (at best) muddles the issue of the time frame. On the one hand, it says that time frame is a policy issue (not a science issue) but on the other hand it perpetuates the use of a 100-year time frame, which is said to represent “equilibrium” conditions.

The use of biogenic carbon in stationary sources is a hot issue, both in Europe and the U.S. I was expecting that this report would deliver a clear and concise message showing that such carbon is a net source of CO₂ to the atmosphere in the short run and potentially neutral in the long-run. Unfortunately, this revision does not deliver that message correctly, nor in a form that can be easily understood by even the interested reader.

At this point, I am not sure what course of action is best, but I will argue that this report should not be delivered to the administrator as representing the SAB.

- 4) Attached please find a copy of the Biogenic Carbon report with a few minor comments (added in the margin). I don’t have any major concerns, although I do wonder whether the changes will satisfy some on the SAB who were strongly pushing for a report that did not specify that a long time frame should be used for BAF calculations. The current report does seem to “double down” on the argument that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. I agree with this argument, and think that the report is correct in this regard. However, I wonder whether it will satisfy some on the SAB.

My primary substantive question relates to BAFs and feedstocks – see my comment on the response to charge question 1(a). Specifically, the report indicates that for certain types of biomass such as agricultural crops, the time horizon over which all positive/negative carbon effects might occur is likely to be short, while for others (forests) it is likely to be longer. Doesn’t that imply that the temporal scale for scientific consideration of carbon stock changes is feedstock dependent? However, in the response to charge question 1(a), the statement is made that the BAF should NOT be feedstock dependent. What am I missing? Perhaps this seeming discrepancy could be clarified somewhere. For example, if you are only using corn stover as biomass, wouldn’t the effective BAF be different than if you were only using hardwood as biomass (because all the positive and negative effects of using corn stover at t=0 would stabilize much sooner...)? My guess is that this can probably be clarified with a few sentences somewhere.

Finally, please note that the report does still contain a reference to the 100-year time frame (page 6 in the version with changes tracked): “Climate focused studies conclude that it is cumulative emissions over roughly a 100-year period that determine the climate response and that different emissions pathways with the same cumulative emissions are likely to produce to a similar global temperature response.” Note that no citations are provided to these studies. I suggest that if you wish to include this, then references to these studies should be included to bolster the claim. However, I’m not sure why this sentence needs to be included at all. Why not drop it? It seems that any mention of a 100-year time frame – even an indirect one such as this – is likely to draw the ire of some SAB members. It’s fine with me to include this statement (as long as appropriate citations are provided) – however, it might cause unnecessary consternation among some on the SAB.

April 18, 2017

Other than that, all of my comments are quite minor. There are a number of typos in the report (I have identified a number of them). I'm sure these will be ironed out in the final editing process.

Lead Reviewer Comments on the Biogenic Carbon Emissions Report Revisions

- 1) I find the revised report unresponsive to the issues raised by the SAB. While the report brings forward an accounting framework that would allow the selection of a time frame to be made by policymakers, it does so without retreating from their earlier prescriptive framing. The result is increased confusion and co-mingling of solid science and policy proscriptive pronouncements/framing.

Please cite statements in the report where you believe the Panel co-mingled science and policy.

On page 18-19 we have state the following to clearly distinguish between the scientific basis for determining T from the policy horizon that could be used to set T. WeAs previously requested by the reviewers we have also discussed the pros and cons of choosing alternative values of T shorter than the one recommended below.

As discussed above, the time horizon, T for scientific consideration of carbon stock changes should be chosen to capture nearly all of the effects on carbon stocks over time and it should not vary by policy, feedstock or landscape conditions. This will allow comparability of BAFs across feedstocks, policies and regions and provide uniform incentives to stationary facilities to use feedstocks with relatively lower BAFs. We recognize that policy may be focused on a time horizon different from T. **However, the BAF on its own is not a policy tool.** It is an estimate of net emissions (tons of carbon) adjusted for carbon sequestration and alternate fates, not a full life cycle accounting of biomass use. **Climate policy objectives should drive policy stringency and not influence the choice of T.** Policy tools that directly target greenhouse gas reductions include emissions caps, technology standards, efficiency standards and carbon pricing. Timelines for reducing greenhouse gas emissions can be achieved by the selection and design of these policy tools. **BAF evaluations should be science based and immune to policy objectives and politics, including changes in administrations.**

On page 4 we have stated that: By arbitrarily selecting a shorter time horizon than this, the cumulative effects on carbon stock would be truncated, and could be over-estimated or under-estimated relative to those at the steady-state level. This could result in an upward or downward bias to the BAF.

Page 4 and page 16

In selecting the time horizon, T, it is important to clearly differentiate scientific criteria from policy considerations. BAF calculations are fundamentally a carbon accounting tool to measure expected future changes in carbon stocks due to increases in demand for bioenergy. Therefore, BAFs should be carbon science based and derived to inform policy decisions on potential biophysical carbon implications. Concerns about the impacts of carbon emissions on the climate

or other systems (e.g., oceans) should affect the choice of policy, such as emissions caps, carbon pricing and technology standards, as well as the stringency of the carbon mitigation targets. As explained in the sections below, we suggest two alternatives for calculating cumulative BAFs, both of which would use the time horizon that incorporates the large majority of effects over time. We do not believe that carbon science supports selecting the time horizon for evaluating a BAF to fit a policy horizon (the EPA's so-called "assessment horizon"). Rather the time horizon should be chosen to capture nearly all (e.g., >95%) of carbon stock effects and be the same across all feedstocks, regions, and all policies. Using the same time horizon for different feedstocks and regions allows one to compare the BAF across regions and feedstocks and will provide incentives to use low carbon feedstocks in all regions. The choice of this time horizon should not differ from one administration to the next or from one policymaker to the next.

On page (ii) we note that

"It is important to clearly differentiate policy from scientific considerations in evaluating BAFs. BAF calculations are fundamentally a carbon accounting activity of expected future changes in carbon stocks due to increases in demand for bioenergy. BAFs and their evaluation should therefore be carbon science-based and derived to assess the implications of policy decisions on carbon stocks. Policy concerns about climate change should be addressed through the selection of appropriate policies and policy targets for greenhouse gas reduction. The stringency of greenhouse gas reduction policy targets should not affect the methods and time-scale used to calculate BAFs."

On page (iii) we state that: "Although we recommend that the BAF be calculated for a time horizon long enough to account for the large majority of changes in terrestrial carbon stocks, we note that both BAF measures (BAF_T and $BAF_{\Sigma T}$) should be calculated for varying levels of T to examine their time paths."

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Given that the accounting for biogenic greenhouse gas emissions is heavily influenced by the temporal dimension and there is no scientific basis for selecting one time frame over another independent of a clear statement of the desired goal, the revised report provides little insight into the fundamental science central to the issues being addressed.

The purpose of this framework is to account for the carbon emissions generated by a stationary facility using biogenic feedstocks. Since these emissions have a temporal dimension and the impact of the additional demand for biomass plays out over a period of time, it would be appropriate to account for all of these effects over time rather than truncating the estimation at an arbitrary time horizon. Based on carbon science, we show that the net biogenic effect varies over time and can be positive or negative and, As a result, the BAF of a feedstock can also be expected to vary over time. Our recommendation for time T is the point at which the NBE from an additional demand for biomass (from all feedstocks in the policy scenario) has stabilized so that all positive and negative effects are accounted for. There is no scientific basis for choosing a shorter time horizon than that we are aware of. If the reviewers are aware of science to support the use of a shorter time horizon for estimating BAF we would be happy to hear about it.

The report is written as if the only greenhouse gas accounting being done with respect to greenhouse gas emissions across the economy is from biogenic emissions, yet that is certainly not the case. This is relevant as central to the usefulness of the report is being able to use the science in the context of the larger set of questions being addressed relative to greenhouse gas emissions from a diversity of sources.

The framework that we were charged to review is focusing only on accounting of greenhouse gas emissions from biogenic sources. We were not asked to review accounting of methods to account for greenhouse gas emissions from other sources. This was stated on page (1) of the letter to the administrator

“The purpose of the 2014 Framework is to develop a method for calculating the adjustment, or Biogenic Assessment Factor (BAF), for carbon emissions associated with the combustion of biogenic feedstocks taking into account the biological carbon cycle effects associated with their growth, harvest, and processing. This mathematical adjustment to stack emissions is needed because of the unique ability of biogenic material to sequester CO₂ from the atmosphere, in biomass and soil, over time frames of years or decades through the process of photosynthesis. The BAF is an accounting term developed in the Framework to denote the offset to total emissions (mathematical adjustment) that reflects a biogenic feedstock’s net carbon emissions after taking into account its sequestration of carbon, in biomass or soil, or emissions that might have occurred with an alternate fate had it not been used for fuel. “

The temporal considerations vary across these other greenhouse gas emission sources/decisions as well. If one extends the logic in the report to the treatment of time and assumptions of equilibrium to all emissions sources it leads to illogical conclusions. Please be specific. ????? We cannot follow your train of logic here. As stated above this framework is unique to facilities using biogenic feedstocks and is not intended to be applied to emissions sources that are not using biogenic feedstocks.

This variation is evident even among biogenic feedstocks, with mill residues having a very different temporal dimension than southern forest harvesting residues and again different from residues in the northwest where standard practices is to burn a lot of this material. Yes, these feedstocks have different temporal profiles and the different temporal profiles will be accounted for in the framework suggested here. Even though all feedstocks have the same T, their BAFs at that time T can be very different. Mill and forest residues that decay anyway will likely have a much smaller BAF than long rotation feedstocks.

- 2) Bottom line I do not think the current report advances our understanding of the fundamental science and in fact confuses things to a degree that I could not support approving the report. I do not know the options for how to move forward, but this revised draft falls well short of addressing the concerns the SAB raised the better part of a year ago with the subcommittee.

The carbon science underlying our recommendations is discussed in the Appendices A-E, in Mark Harmon's Comment. The figures in the text are based on the technical material presented in the appendices to illustrate the various cases that can arise and their implications for BAFs.

2) As noted in my comments on the report from last week, I was concerned that the updates to the Biogenic Carbon report would not satisfy at least some people on the SAB.

During our group call, we had all discussed edits that would emphasize that a BAF could be assessed at any time period t , and that the BAF would differ depending on the selected time period.

This is still the case, as emphasized on page xxx6, lines 5 – 6.

On page 18 we state

Using a carbon stock formulation, we show below how the estimate of cumulative BAF is affected by the time horizon over which the carbon impact is computed. This is because the estimate of net biogenic emissions, defined as the difference in stocks of carbon between the reference (baseline) scenario and the policy scenario, varies with the time horizon.

Figures 3 and 4 illustrate cases where BAF is increasing, decreasing or increasing and then decreasing over time.

As noted by Bill below, this implies (in general) that biogenic carbon can be a net source of CO₂ in the short run and potentially neutral in the long-run.

This is one of the cases, as shown in Figure ~~xxx~~4— In fact as shown in the figures, net carbon stocks are always lower in the policy scenario compared to the reference case in this illustration.

Within that context, one could also note that “long run” BAFs that capture all (or most) positive and negative effects would likely be most relevant for long-run climate changes, but that “shorter-run” BAFs could be relevant for other purposes (or something like that – as you know I’m not a climate expert).

Whether a longer run or a shorter run BAF should be used is a policy decision. We do not have a scientific rationale to support the shorter-run BAFs. We also recommend a cumulative BAF that aggregates effects over time rather than an annual BAF that measures carbon stock effects at a point in time since it is cumulative emissions that have been shown to affect climate.

I’m not as concerned about this issue as others on the SAB, and am more amenable to the approach taken by the panel. Nonetheless, as Bill notes below, the updated report does still retain aspects that are likely to be objectionable to some on the SAB. For example, the report still strongly argues that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. It seems as if the panel is fairly adamant about supporting this “long run” BAF—and this is the very issue that is a problem for others on the SAB. I’m not sure how to get beyond this impasse. Yes,

We want to clarify that while we say that T should selected as the Panel is adamant about time when the NBE has stabilized, we are not claiming that this point will necessarily take a ‘long run’ to occur.

On page 18 we note

Several factors determine when the difference in carbon stocks between the reference and yes, if the policy scenario stabilizes, an indication that T has been reached (Appendices B, C, D). A major factor is the “speed” with which carbon stocks respond after harvest; this is the source determined, for example, by the speed with which a feedstock regrows and can be harvested again, the mix of disagreement with some feedstocks produced and the rate at which soil carbon stocks change. Thus the mix of our SAB vetters feedstocks that are demanded by stationary facilities can influence the time horizon T. Other factors could include the scale of the demand for biogenic feedstocks, the rate at which that demand will grow in the future and the anticipation period available to landowners during which they can plan to meet expected demand. In addition, system response time could also be determined by underlying changes in the environment, particularly if those changes interact more with the policy scenario than the reference scenario (see Cases 4 and 5 in Appendix D).

I’ve viewed my primary role in this quality review as trying to find some compromise or middle-ground that will satisfy both the panel and others on the SAB, and I’m still hopeful that this can be achieved. But I’m not sure the best way forward from here.

April 18, 2017

pg. 2

3) I am most unhappy with the current, revised version of the Biogenic Carbon Report. There have been some “band-aid” fixes to the earlier version, but this revision (at best) muddles the issue of the time frame. On the one hand, it says that time frame is a policy issue (not a science issue) but on the other hand it perpetuates the use of a 100-year time frame, which is said to represent “equilibrium” conditions.

I could not find where we have said the part in yellow

We have not said that a 100 year time frame is ~~needed~~needed to reach equilibrium.

The use of biogenic carbon in stationary sources is a hot issue, both in Europe and the U.S. I was expecting that this report would deliver a clear and concise message showing that such carbon is a net source of CO₂ to the atmosphere in the short run and potentially neutral in the long-run.

We were asked to review a framework and now to show whether or not its use would show that biogenic feedstocks are a net source of CO₂ in the short run vs long run. The framework developed by EPA and our suggestions will result in BAFs being different across feedstocks and regions. Whether a feedstock ends up being a net source or a sink for carbon can only be determined the modeling is done

The ecological-economic modeling does not necessarily support this prediction. Several cases are possible as shown in Figure 3 and 4. Biogenic carbon could be a net source or a net sink for carbon in the short run and vice versa in the long run. This can only be determined after the modeling exercise is completed. Our simple illustrations in the report show that any of these cases is possible.

Unfortunately, this revision does not deliver that message correctly, nor in a form that can be easily understood by even the interested reader.

At this point, I am not sure what course of action is best, but I will argue that this report should not be delivered to the administrator as representing the SAB.

4) Attached please find a copy of the Biogenic Carbon report with a few minor comments (added in the margin). I don’t have any major concerns, although I do wonder whether the changes will satisfy some on the SAB who were strongly pushing for a report that did not specify that a long time frame should be used for BAF calculations. The current report does seem to “double down” on the argument that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. I agree with this argument, and think that the report is correct in this regard. However, I wonder whether it will satisfy some on the SAB.

My primary substantive question relates to BAFs and feedstocks – see my comment on the response to charge question 1(a). Specifically, the report indicates that for certain types of biomass such as agricultural crops, the time horizon over which all positive/negative carbon effects might occur is likely to be short, while for others (forests) it is likely to be longer. Doesn't that imply that the temporal scale for scientific consideration of carbon stock changes is feedstock dependent? We are saying that the T should not vary across feedstocks. However, with the same T, the BAF can and should vary across feedstocks. However, in the response to charge question 1(a), the statement is made that the BAF should NOT be feedstock dependent. What am I missing? Perhaps this seeming discrepancy could be clarified somewhere. For example, if you are only using corn stover as biomass, wouldn't the effective BAF be different than if you were only using hardwood as biomass (because all the positive and negative effects of using corn stover at t=0 would stabilize much sooner...)? My guess is that this can probably be clarified with a few sentences somewhere.

Finally, please note that the report does still contain a reference to the 100-year time frame (page 6 in the version with changes tracked): "Climate focused studies conclude that it is cumulative emissions over roughly a 100-year period that determine the climate response and that different emissions pathways with the same cumulative emissions are likely to produce to a similar global temperature response." Note that no citations are provided to these studies. The SAB Staff Office (unfortunately) has a policy against citations in an Executive Summary but there are two studies showing this. Allen, et. al. 2009. Warming Caused by Cumulative Carbon Emissions toward the Trillionth Tonne. *Nature*, 1163-1166 and Matthews, et. al. 2009. The Proportionality of Global Warming to Cumulative Carbon Emissions. *Nature*. 829-832. We can add back the references. I suggest that if you wish to include this, then references to these studies should be included to bolster the claim. However, I'm not sure why this sentence needs to be included at all. Why not drop it? It seems that any mention of a 100-year time frame – even an indirect one such as this – is likely to draw the ire of some SAB members. Not sure that's a good reason to exclude science. It's fine with me to include this statement (as long as appropriate citations are provided) – however, it might cause unnecessary consternation among some on the SAB.

April 18, 2017

pg. 3

Other than that, all of my comments are quite minor. There are a number of typos in the report (I have identified a number of them). I'm sure these will be ironed out in the final editing process.

Response to Lead Reviewer Comments on the Biogenic Carbon Emissions Report
Revisions

Reviewer 1:

I find the revised report unresponsive to the issues raised by the SAB. While the report brings forward an accounting framework that would allow the selection of a time frame to be made by policymakers, it does so without retreating from their earlier prescriptive framing.

The result is increased confusion and co-mingling of solid science and policy proscriptive pronouncements/framing.

Response:

The draft report does not explicitly mingle policy and science, and the draft report includes several sections to differentiate the importance that the SAB placed on not mingling science with policy choices.

Please cite specific statements in the draft report where you believe the Panel co-mingled science and policy or created a confusing context associated with the use of the term ‘policy’.

There are various examples throughout the draft report that inform the reader that the intent of the SAB is to not provide policy advice to the EPA, but rather focus on scientific advice. For example, within the first paragraph of the response to charge question 1(a), we have stated the following to clearly distinguish between the scientific basis for determining T from the policy horizon that could be used to set T.

As discussed above, the time horizon, T for scientific consideration of carbon stock changes should be chosen to capture nearly all of the effects on carbon stocks over time and it should not vary by policy, feedstock or landscape conditions. This will allow comparability of BAFs across feedstocks, policies and regions and provide uniform incentives to stationary facilities to use feedstocks with relatively lower BAFs. We recognize that policy may be focused on a time horizon different from T. However, the BAF on its own is not a policy tool. It is an estimate of net emissions (tons of carbon) adjusted for carbon sequestration and alternate fates, not a full life cycle accounting of biomass use. Climate policy objectives should drive policy stringency and not influence the choice of T. Policy tools that directly target greenhouse gas reductions include emissions caps, technology standards, efficiency standards and carbon pricing. Timelines for reducing greenhouse gas emissions can be achieved by the selection and design of these policy tools. BAF evaluations should be science based and immune to policy objectives and politics, including changes in administrations.

As noted on page iii of the cover letter, the draft report emphasizes the importance of clearly differentiating policy from scientific considerations in evaluating BAFs.

“It is important to clearly differentiate policy from scientific considerations in evaluating BAFs. BAF calculations are fundamentally a carbon accounting activity of expected future changes in carbon stocks due to increases in demand

for bioenergy. BAFs and their evaluation should therefore be carbon science-based and derived to assess the implications of policy decisions on carbon stocks. Policy concerns about climate change should be addressed through the selection of appropriate policies and policy targets for greenhouse gas reduction. The stringency of greenhouse gas reduction policy targets should not affect the methods and time-scale used to calculate BAFs. "

The draft report notes that the SAB would have benefited from the agency laying out a specific context for the SAB to consider in order to assess the pros and cons of a proposed framework. The panel defines these choices by the EPA as the 'policy context' under which the panel sought to assess EPA's framework. As noted in the draft report,

"the Framework needs to be applied in a specific policy context with specific BAF calculations and clearly defined boundaries for EPA's regulatory authority. (cover letter p. 2, lines 19-20).

Also, under the Executive Summary's "Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)", the fourth paragraph notes:

"In selecting the time horizon, T, it is important to clearly differentiate scientific criteria from policy considerations. BAF calculations are fundamentally a carbon accounting tool to measure expected future changes in carbon stocks due to increases in demand for bioenergy. Therefore, BAFs should be carbon science based and derived to inform policy decisions on potential biophysical carbon implications. Concerns about the impacts of carbon emissions on the climate or other systems (e.g., oceans) should affect the choice of policy, such as emissions caps, carbon pricing and technology standards, as well as the stringency of the carbon mitigation targets. As explained in the sections below, we suggest two alternatives for calculating cumulative BAFs, both of which would use the time horizon that incorporates the large majority of effects over time. We do not believe that carbon science supports selecting the time horizon for evaluating a BAF to fit a policy horizon (the EPA's so-called "assessment horizon"). Rather the time horizon should be chosen to capture nearly all (e.g., >95%) of carbon stock effects and be the same across all feedstocks, regions, and all policies. Using the same time horizon for different feedstocks and regions allows one to compare the BAF across regions and feedstocks and will provide incentives to use low carbon feedstocks in all regions. The choice of this time horizon should not differ from one administration to the next or from one policymaker to the next."

Section 3.5 of the draft report, under "General Comments on the Time Horizon for BAF Evaluation", reiterates the above paragraph's statements regarding how BAFs should be carbon science based and how such BAFs would inform policy decisions. This section also makes explicit statements that clarify the intent to differentiate policy considerations from science:

"During our deliberations, we realized that it is important to clearly differentiate policy from scientific considerations. We also realized a number of public commenters were discussing climate impacts and intertemporal tradeoffs in these impacts, whereas our task was to account for effects of biogenic feedstocks on

carbon stocks—literally, tons of carbon added to or removed from the atmosphere. BAF calculations are fundamentally a carbon accounting activity based on expected future changes in carbon stocks due to increases in biomass demand for energy. Therefore, BAFs should be carbon-science based and derived to inform policy decisions on potential physical carbon implications. Climate policy concerns and intertemporal tradeoffs are independent considerations that should affect the selection and stringency of policy tools that directly target greenhouse gas emissions. Such policy tools include emissions caps, technology standards, efficiency standards, carbon pricing and other approaches. All of these policy tools can be adjusted to meet a particular timeline of emissions reductions or reflect changing policy perceptions of climate risk. However, the BAF values should be unaffected.”

In addition, the Executive Summary, under “Importance of the Policy Context”, first and second paragraphs, also clarifies how a specific policy context would assist the SAB in providing its advice:

“The question before the agency and hence the SAB, was whether and how to consider biogenic greenhouse gas (GHG) emissions in reaching thresholds for permitting and decisions about BACT for CO₂ emissions from bioenergy. The agency has removed this policy context from its 2014 Framework and the EPA’s charge questions seek general guidance on issues related to the choice of temporal, spatial and production scale for determining Biogenic Assessment Factors (BAFs) in a policy-neutral context. This change hampered the ability of the SAB to assess the suitability of the 2014 Framework for use as a science-based regulatory framework. While some of our responses may be robust to multiple policy and implementation choices, we do not know without specific contexts such as the choice of BAF metric and time scale. In fact, the lack of information in both Frameworks on how the EPA may use potential BAFs made it difficult to fully evaluate these frameworks. As we stated in our 2012 report and we reiterate here: this SAB review would have been enhanced if the Agency offered a specific regulatory application that, among other things, provided explicit proposed BAF calculations and defined its legal boundaries regarding upstream and downstream emissions in the feedstock life cycles.

A policy context would also be helpful in clarifying if the purpose of performing carbon accounting with the proposed Framework is to account for the emissions of all greenhouse gases.”

Section 3.1 of the draft report, under the “Overarching Comments” section, further describes the purposes and reasoning for why the SAB sought a policy context within which the SAB could provide its scientific advice.

Furthermore, in Section 3.5 of the draft report, under “General Comments on the Time Horizon for BAF Evaluation”, the draft report makes explicit statements that clarify the intent to differentiate policy considerations from science:

~~“During our deliberations, we realized that it is important to clearly differentiate policy from scientific considerations. We also realized a number of public~~

~~commenters were discussing climate impacts and intertemporal tradeoffs in these impacts, whereas our task was to account for effects of biogenic feedstocks on carbon stocks—literally, tons of carbon added to or removed from the atmosphere. BAF calculations are fundamentally a carbon accounting activity based on expected future changes in carbon stocks due to increases in biomass demand for energy. Therefore, BAFs should be carbon science based and derived to inform policy decisions on potential physical carbon implications. Climate policy concerns and intertemporal tradeoffs are independent considerations that should affect the selection and stringency of policy tools that directly target greenhouse gas emissions. Such policy tools include emissions caps, technology standards, efficiency standards, carbon pricing and other approaches. All of these policy tools can be adjusted to meet a particular timeline of emissions reductions or reflect changing policy perceptions of climate risk. However, the BAF values should be unaffected.~~

Reviewer 1:

Given that the accounting for biogenic greenhouse gas emissions is heavily influenced by the temporal dimension and there is no scientific basis for selecting one time frame over another independent of a clear statement of the desired goal, the revised report provides little insight into the fundamental science central to the issues being addressed.

Response:

The scientific basis for SAB's advice that recommends selection of a longer-scale time frame is described within the draft report, as discussed further below. The draft report notes that the purpose of this framework is to account for the carbon emissions generated by a stationary facility using biogenic feedstocks. Since these emissions have a temporal dimension and the impact of the additional demand for biomass plays out over a period of time, it would be appropriate to account for all of these effects over time rather than truncating the estimation at an arbitrary time horizon. Based on carbon science, we show that the net biogenic effect varies over time and can be positive or negative and, As a result, the BAF of a feedstock can also be expected to vary over time. Our recommendation for time T is the point at which the NBE from an additional demand for biomass (from all feedstocks in the policy scenario) has stabilized so that all positive and negative effects are accounted for. There is no scientific basis for choosing a shorter time horizon than that, we are aware of. If the reviewers are aware of science to support the use of a shorter time horizon for estimating BAF we would be happy to hear about it.

Within the draft report, as previously requested by the reviewers we have discussed the cons of choosing alternative values of T shorter than the timeframe that the Panel recommends. As described in the draft report under the Executive Summary's "Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)", third paragraph "A key charge question...":

"By arbitrarily selecting a shorter time horizon than recommended by the panel, the cumulative effects on carbon stock would be truncated, and could be over-

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estimated or under-estimated relative to those at the steady-state level. This could result in an upward or downward bias to the BAF.” (See also page 2 of the cover letter within the following paragraph: “Using a carbon stock formulation...”, and section 4.1, Temporal Scale for Biogenic Accounting”, under the ‘Charge Question 1’ response, within the paragraph beginning “Using a carbon stock formulation...”).

In addition, on page iii of the cover letter, the draft report notes that cumulative BAF that aggregates effects over time would provide estimates of cumulative emissions that have been shown to affect climate. The cover letter notes that ~~“the~~:

“The choice of appropriate cumulative BAF metric should be informed by a scientific assessment of the dynamics of additions to atmospheric carbon stocks and mechanisms by which changes in atmospheric carbon stocks affect the climate and other ecosystem functions, such as ocean acidification. For one of these effects, namely global temperature, we cite studies showing that it is likely to be affected by cumulative emissions over a long time period and that it is not likely to differ much across different scenarios of emissions pathways over the next several decades as long as there are equivalent cumulative emissions in the long run. The climate effect of cumulative changes in carbon stocks in the long run is therefore likely to be captured by EPA’s cumulative BAF while the effect of transitional changes in carbon stock in the near term on the climate is more likely to be captured by the second cumulative BAF alternative. “

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The carbon science underlying our recommendations is discussed in the Appendices A-E. in Mark Harmon’s Comment. The figures in the text are based on the technical material presented in the appendices to illustrate the various cases that can arise and their implications for BAFs.

The draft report further notes, under Section 3.2, “Future Anticipated Baseline Approach”, that a reference point baseline approach where a shorter time frame is considered is inadequate in cases where feedstocks accumulate over long time periods because it does not estimate the *additional* effect of a stationary facility’s combustion of biomass on carbon emissions over time. The draft report provides reasons that support a longer-term timescale due to the need to assess growth of forest biomass, carbon sequestration, and land use changes. The draft report notes in this section that:

“In the case of long rotation feedstocks, bioenergy demand can affect carbon stocks in many ways including the harvest ages of trees, the diversion of forest biomass from traditional forest product markets to bioenergy and rates of afforestation and deforestation. Estimating the net effect of these changes on carbon stocks requires a model that integrates market demand and supply conditions with biophysical conditions that determine growth of forest biomass, losses via decomposition, carbon sequestration and fluxes due to harvests and land use change and incorporates the spatial variability in these effects across the U.S. (see section 3.2, “Future Anticipated Baseline Approach”, second paragraph).

In addition, as further described in the second to last paragraph of the response to Charge Question 1(c), the draft report also expresses the need for caution in conducting modeling efforts that project into the future:

With either approach to evaluating BAF, caution is advised with projections into the future. For example, a BAF calculation is based on modeling that employs two assumptions: (1) it assumes feedstock regrowth following an assumed rotation length; and (2) it assumes that carbon sequestered in soils would continue indefinitely. Given the uncertainty about the maintenance of our forests and agricultural land use policies and practices, the BAF needs to be updated periodically to reflect the latest data and trends. A one-time cumulative BAF will need to be revised periodically to reflect changing conditions. Therefore, the model used to determine the BAF needs to be updated and validated periodically to ensure that the underlying information on which it is based is still valid. Additionally, the likelihood of a cumulative BAF being realistic also depends on other policies in place that encourage or, at least, do not discourage long term sustainable land and forest management.

While the SAB recommends that BAF be calculated for a long time period, the SAB recognizes that the agency may want to assess BAF at shorter time scales. Therefore, page (iii) of the cover letter further states that: “Although we recommend that the BAF be calculated for a time horizon long enough to account for the large majority of changes in terrestrial carbon stocks, we note that both BAF measures (BAF_T and $BAF_{\Sigma T}$) should be calculated for varying levels of T to examine their time paths. If the time path of carbon stock changes between the references and policy scenarios is of particular interest, then the second alternative cumulative BAF will provide this information for any time horizon of interest.” (See also the Executive Summary’s “Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)” discussion, last paragraph beginning “Both cumulative BAFs...”)

Reviewer 1:

The report is written as if the only greenhouse gas accounting being done with respect to greenhouse gas emissions across the economy is from biogenic emissions, yet that is certainly not the case. This is relevant as central to the usefulness of the report is being able to use the science in the context of the larger set of questions being addressed relative to greenhouse gas emissions from a diversity of sources.

Response: The framework that we were charged to review is focusing only on accounting of greenhouse gas emissions from biogenic sources. We were not asked to review accounting of methods to account for greenhouse gas emissions from other sources. This was stated on page i of the cover letter to the Administrator:

“The purpose of the 2014 Framework is to develop a method for calculating the adjustment, or Biogenic Assessment Factor (BAF), for carbon emissions associated with the combustion of biogenic feedstocks taking into account the biological carbon cycle effects associated with their growth, harvest, and processing. This mathematical adjustment to stack emissions is needed because of the unique ability of biogenic material to sequester CO₂ from the atmosphere, in

biomass and soil, over time frames of years or decades through the process of photosynthesis. The BAF is an accounting term developed in the Framework to denote the offset to total emissions (mathematical adjustment) that reflects a biogenic feedstock's net carbon emissions after taking into account its sequestration of carbon, in biomass or soil, or emissions that might have occurred with an alternate fate had it not been used for fuel."

The draft report notes in various locations that other sources of emissions would need to be considered for emissions accounting consistency across all fuel types (e.g., see Executive Summary under "Alternate Fate approach for Waste-Derived Feedstocks"; Section 3.1 "Policy Context", paragraph 5; and Section 3.4, "Alternate Fate Approach for Waste-Derived Feedstocks"). Also, the cover letter, p. i, notes: "*The purpose of the 2014 Framework is to develop a method for calculating the adjustment, or Biogenic Assessment Factor (BAF), for carbon emissions associated with the combustion of biogenic feedstocks taking into account the biological carbon cycle effects associated with their growth, harvest, and processing.*"

Reviewer 1:

The temporal considerations vary across these other greenhouse gas emission sources/decisions as well. If one extends the logic in the report to the treatment of time and assumptions of equilibrium to all emissions sources it leads to illogical conclusions.

Response: Please be specific. We cannot follow your train of logic here. As stated above this framework is unique to facilities using biogenic feedstocks and is not intended to be applied to emissions sources that are not using biogenic feedstocks.

As discussed in the Executive Summary's section on "Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1), the draft report recognizes there are varying BAFs at varying times for biogenic sources, and recommends that EPA calculate the BAFs for other time periods that may be of interest. The draft report makes no statement that extends this recommendation to analyses on other emissions sources, because the focus of the draft report is on biogenics.

Reviewer 1:

This variation is evident even among biogenic feedstocks, with mill residues having a very different temporal dimension than southern forest harvesting residues and again different from residues in the northwest where standard practices is to burn a lot of this material.

Response: Yes, these feedstocks have different temporal profiles and the different temporal profiles will be accounted for in the framework suggested here. The draft report notes that even though all feedstocks have the same T, their BAFs at that time T can be very different. Mill and forest residues that decay anyway will likely have a much smaller BAF than long rotation feedstocks.

Specifically, in Section 4.1, within the response to charge question 1, last paragraph, the draft report notes: "*Because various feedstocks might have different response times, the dynamics of the time varying effects of a feedstock on carbon stocks may play out over different temporal scales for different feedstocks and regions. Integrating multiple*

feedstocks within and among regions would require some method of standardization.”
Also, in Section 4.2, in the response to Charge Question 2b, the text notes that *“If the EPA’s goal is to obtain a region-specific BAF for a feedstock, it will be necessary to project region-specific, feedstock-specific demand for biomass. Since the BAF for a feedstock could differ depending on the method of production (for example, the soil carbon implications of corn stover will depend on the type of tillage practice used and the amount of residue harvested), it will be appropriate to have the BAF for a feedstock in a region vary by feedstock production method.”*

Reviewer 1:

Bottom line I do not think the current report advances our understanding of the fundamental science and in fact confuses things to a degree that I could not support approving the report. I do not know the options for how to move forward, but this revised draft falls well short of addressing the concerns the SAB raised the better part of a year ago with the subcommittee.

Reviewer 2:

As noted in my comments on the report from last week, I was concerned that the updates to the Biogenic Carbon report would not satisfy at least some people on the SAB.

During our group call, we had all discussed edits that would emphasize that a BAF could be assessed at any time period t , and that the BAF would differ depending on the selected time period.

Response: Yes, the BAF will differ, depending on the selected time period, as we emphasized on p (iii) of the cover letter, and in the Executive Summary’s “Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)” discussion, last paragraph beginning “Both cumulative BAFs...”.

On p. iii of the cover letter, specifically we said: *“Although we recommend that the BAF be calculated for a time horizon long enough to account for the large majority of changes in terrestrial carbon stocks, we note that both BAF measures (BAF_T and $BAF_{\Sigma T}$) should be calculated for varying levels of T to examine their time paths.”*

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In Section 4.1, “Temporal Scale for Biogenic Accounting”, in the response to Charge Question 1, the seventh paragraph notes the following:

“Using a carbon stock formulation, we show below how the estimate of cumulative BAF is affected by the time horizon over which the carbon impact is computed. This is because the estimate of net biogenic emissions, defined as the difference in stocks of carbon between the reference (baseline) scenario and the policy scenario, varies with the time horizon.”

Also, Figures 3 and 4 illustrate cases where BAF is increasing, decreasing or increasing and then decreasing over time.

Reviewer 2:

As noted by Bill below, this implies (in general) that biogenic carbon can be a net source of CO₂ in the short run and potentially neutral in the long-run.

Response: This is one of the illustrative cases, as shown in Figure 4 of the draft report. In fact as shown in the illustration of a decreasing carbon case, net carbon stocks are always lower in the policy scenario compared to the reference case in this illustration.

Reviewer 2:

Within that context, one could also note that “long run” BAFs that capture all (or most) positive and negative effects would likely be most relevant for long-run climate changes, but that “shorter-run” BAFs could be relevant for other purposes (or something like that – as you know I’m not a climate expert).

Response: Whether a longer run or a shorter run BAF should be used is a policy decision. We do not have a scientific rationale to support the shorter-run BAFs. See further discussion on this topic in the draft report under the Executive Summary’s “Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)”, third paragraph “A key charge question...”; on page 2 of the cover letter within the following paragraph: “Using a carbon stock formulation...”; and in section 4.1, Temporal Scale for Biogenic Accounting”, under the ‘Charge Question 1’ response, within the paragraph beginning “Using a carbon stock formulation...” We also recommend, in the cover letter, page iii, that a cumulative BAF that aggregates effects over time rather than an annual BAF that measures carbon stock effects at a point in time, noting that it is cumulative emissions that have been shown to affect climate.

Reviewer 2:

I’m not as concerned about this issue as others on the SAB, and am more amenable to the approach taken by the panel. Nonetheless, as Bill notes below, the updated report does still retain aspects that are likely to be objectionable to some on the SAB. For example, the report still strongly argues that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. It seems as if the panel is fairly adamant about supporting this “long run” BAF—and this is the very issue that is a problem for others on the SAB. I’m not sure how to get beyond this impasse.

Response: Yes, the Panel is adamant about this point and yes, it is the source of disagreement with some of our SAB vetters.

Response: We want to clarify that while we say that T should selected as the time when the NBE has stabilized, we are not claiming that this will necessarily take a ‘long run’ to occur. In Section 4.1, “Temporal Scale for Biogenic Accounting”, in the response to Charge Question 1, the sixth paragraph notes the following:

“Several factors determine when the difference in carbon stocks between the reference and the policy scenario stabilizes, an indication that T has been reached (Appendices B, C, D). A major factor is the “speed” with which carbon stocks respond after harvest; this is determined, for example, by the speed with which a feedstock regrows and can be harvested again, the mix of feedstocks

produced and the rate at which soil carbon stocks change. Thus the mix of feedstocks that are demanded by stationary facilities can influence the time horizon T. Other factors could include the scale of the demand for biogenic feedstocks, the rate at which that demand will grow in the future and the anticipation period available to landowners during which they can plan to meet expected demand. In addition, system response time could also be determined by underlying changes in the environment, particularly if those changes interact more with the policy scenario than the reference scenario (see Cases 4 and 5 in Appendix D)."

Reviewer 2:

I've viewed my primary role in this quality review as trying to find some compromise or middle-ground that will satisfy both the panel and others on the SAB, and I'm still hopeful that this can be achieved. But I'm not sure the best way forward from here.

Reviewer 3:

I am most unhappy with the current, revised version of the Biogenic Carbon Report. There have been some "band-aid" fixes to the earlier version, but this revision (at best) muddles the issue of the time frame. On the one hand, it says that time frame is a policy issue (not a science issue) but on the other hand it perpetuates the use of a 100-year time frame, which is said to represent "equilibrium" conditions.

Response:

First, we differentiate between the time frame for assessing a BAF and the climatological time frame over which carbon stocks drive global temperature changes. The Panel offered its scientific input on the former and cited studies on the latter. In general, the Panel believes the science supports calculating a BAF over a time period that incorporates all effects. We do not say that a 100-year time frame is needed to reach equilibrium.

The draft report consistently recommends that EPA use a time horizon to calculate cumulative BAFs that captures nearly all (>95%) of positive and negative effects on carbon stock over time. It also recommends that BAFs for varying levels of T should also be calculated to provide information on how cumulative BAF might change for time periods of particular interest.

As noted on page iii of the cover letter, and Section 3.5 of the draft report (General Comments on the Time Horizon for BAF Evaluation), the draft report emphasizes the importance of clearly differentiating policy from scientific considerations in evaluating BAFs. "

"It is important to clearly differentiate policy from scientific considerations in evaluating BAFs. BAF calculations are fundamentally a carbon accounting activity of expected future changes in carbon stocks due to increases in demand for bioenergy. BAFs and their evaluation should therefore be carbon science-based and derived to assess the implications of policy decisions on carbon stocks.

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Policy concerns about climate change should be addressed through the selection of appropriate policies and policy targets for greenhouse gas reduction. The stringency of greenhouse gas reduction policy targets should not affect the methods and time-scale used to calculate BAFs."

Reviewer 3:

The use of biogenic carbon in stationary sources is a hot issue, both in Europe and the U.S. I was expecting that this report would deliver a clear and concise message showing that such carbon is a net source of CO₂ to the atmosphere in the short run and potentially neutral in the long-run.

Response: The ecological-economic modeling does not necessarily support this prediction (that biogenic carbon will increase atmospheric carbon levels in the short run and will be neutral in the long run). Several cases are possible as shown in Figure 3 and 4. Biogenic carbon could be a net source or a net sink for carbon in the short run and vice versa in the long run. This can only be determined after the modeling exercise is completed. Our simple illustrations in the report show that any of these cases is possible.

We were asked to review a framework and not to show whether or not its use would show that biogenic feedstocks are a net source of CO₂ in the short run vs long run. The framework developed by EPA and our suggestions will result in BAFs being different across feedstocks and regions. Whether a feedstock ends up being a net source or a sink for carbon can only be determined after the modeling is done.

Reviewer 3:

Unfortunately, this revision does not deliver that message correctly, nor in a form that can be easily understood by even the interested reader.

At this point, I am not sure what course of action is best, but I will argue that this report should not be delivered to the administrator as representing the SAB.

Response: Recommend discussion this comment with the reviewer.

Reviewer 4:

Attached please find a copy of the Biogenic Carbon report with a few minor comments (added in the margin). I don't have any major concerns, although I do wonder whether the changes will satisfy some on the SAB who were strongly pushing for a report that did not specify that a long time frame should be used for BAF calculations. The current report does seem to "double down" on the argument that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. I agree with this argument, and think that the report is correct in this regard. However, I wonder whether it will satisfy some on the SAB.

My primary substantive question relates to BAFs and feedstocks – see my comment on the response to charge question 1(a). Specifically, the report indicates that for certain types of biomass such as agricultural crops, the time horizon over which all positive/negative carbon effects might occur is likely to be short, while for others (forests) it is likely to be longer. Doesn't

that imply that the temporal scale for scientific consideration of carbon stock changes is feedstock dependent.

Response: We are saying that the T should not vary across feedstocks. However, with the same T, the BAF can and should vary across feedstocks.

As noted in the last paragraph of the response to Charge question 1, the draft report notes: *"Because various feedstocks might have different response times, the dynamics of the time varying effects of a feedstock on carbon stocks may play out over different temporal scales for different feedstocks and regions. Integrating multiple feedstocks within and among regions would require some method of standardization."* Also, the response to Charge Question 2b notes that *"If the EPA's goal is to obtain a region-specific BAF for a feedstock, it will be necessary to project region-specific, feedstock-specific demand for biomass. Since the BAF for a feedstock could differ depending on the method of production (for example, the soil carbon implications of corn stover will depend on the type of tillage practice used and the amount of residue harvested), it will be appropriate to have the BAF for a feedstock in a region vary by feedstock production method."*

Reviewer 4:

However, in the response to charge question 1(a), the statement is made that the BAF should NOT be feedstock dependent. What am I missing? Perhaps this seeming discrepancy could be clarified somewhere. For example, if you are only using corn stover as biomass, wouldn't the effective BAF be different than if you were only using hardwood as biomass (because all the positive and negative effects of using corn stover at $t=0$ would stabilize much sooner...)? My guess is that this can probably be clarified with a few sentences somewhere.

Response: The response to charge question 1(a) notes that the time horizon, T for scientific consideration of carbon stock changes should be chosen to capture nearly all of the effects on carbon stocks over time and it should not vary by policy, feedstock or landscape conditions. This will allow comparability of BAFs across feedstocks, policies and regions and provide uniform incentives to stationary facilities to use feedstocks with relatively lower BAFs.

Reviewer 4:

Finally, please note that the report does still contain a reference to the 100-year time frame (page 6 in the version with changes tracked): "Climate focused studies conclude that it is cumulative emissions over roughly a 100-year period that determine the climate response and that different emissions pathways with the same cumulative emissions are likely to produce to a similar global temperature response." Note that no citations are provided to these studies.

Response: The SAB Staff Office (unfortunately) has a policy against citations in an Executive Summary but there are two studies showing this. Allen, et. al. 2009. Warming Caused by Cumulative Carbon Emissions toward the Trillionth Tonne. Nature, 1163-1166 and Matthews, et. al. 2009. The Proportionality of Global Warming to Cumulative Carbon Emissions. Nature. 829-832. We can add back the references.

I suggest that if you wish to include this, then references to these studies should be included to bolster the claim. However, I'm not sure why this sentence needs to be included at all. Why not drop it? It seems that any mention of a 100-year time frame – even an indirect one such as this – is likely to draw the ire of some SAB members.

Response: Not sure that's a good reason to exclude science.

It's fine with me to include this statement (as long as appropriate citations are provided) – however, it might cause unnecessary consternation among some on the SAB.

Other than that, all of my comments are quite minor. There are a number of typos in the report (I have identified a number of them). I'm sure these will be ironed out in the final editing process.

Response: No response to this comment.

Response to Lead Reviewer Comments on Biogenic Carbon Emissions Report Revisions
5/3/17 draft

Reviewer 1:

I find the revised report unresponsive to the issues raised by the SAB. While the report brings forward an accounting framework that would allow the selection of a time frame to be made by policymakers, it does so without retreating from their earlier prescriptive framing.

The result is increased confusion and co-mingling of solid science and policy proscriptive pronouncements/framing.

Response:

The draft report does not explicitly mingle policy and science, and the draft report includes several sections to differentiate the importance that the SAB placed on not mingling science with policy choices. The draft report will be reviewed to potentially make clarification edits that may help to reduce any confusion that a reader may have on the use of the term 'policy' as used within the draft report in order to ensure that the term 'policy' is used strictly in a scientific context and not as if the SAB is providing advice on what policies the agency should follow.

Please cite specific statements in the draft report where you believe the Panel co-mingled science and policy or created a confusing context associated with the use of the term 'policy'.

There are various examples throughout the draft report that inform the reader that the intent of the SAB is to not provide policy advice to the EPA, but rather focus on scientific advice. For example, within the first paragraph of the response to charge question 1(a), we have stated the following to clearly distinguish between the scientific basis for determining T from the policy horizon that could be used to set T.

As discussed above, the time horizon, T for scientific consideration of carbon stock changes should be chosen to capture nearly all of the effects on carbon stocks over time and it should not vary by policy, feedstock or landscape conditions. This will allow comparability of BAFs across feedstocks, policies and regions and provide uniform incentives to stationary facilities to use feedstocks with relatively lower BAFs. We recognize that policy may be focused on a time horizon different from T. However, the BAF on its own is not a policy tool. It is an estimate of net emissions (tons of carbon) adjusted for carbon sequestration and alternate fates, not a full life cycle accounting of biomass use. Climate policy objectives should drive policy stringency and not influence the choice of T. Policy tools that directly target greenhouse gas reductions include emissions caps, technology standards, efficiency standards and carbon pricing. Timelines for reducing greenhouse gas emissions can be achieved by the selection and design of these policy tools. ~~BAF evaluations should be science-based and immune to policy objectives and politics, including changes in administrations. BAF calculations should be science based and should not be calculated based upon policy objectives.~~

Commented [HE1]: Recommend leaving this sentence in. Ed will try to identify areas of the draft report's discussion on 'policy' that seem confusing, and suggest modified text to improve clarity while keeping the intent of the language intact.

Commented [HE2]: Recommend removal of the clause: "and politics, including changes in administrations" since it is an inflammatory, unscientific statement that does not seem necessary to be made to support the earlier scientific statements in the paragraph. Earlier in the paragraph, the text notes that T should not vary by policy.

Recommend also changing the words 'evaluation' to 'calculation' and changing 'immune to policy objectives' to 'not be calculated based upon policy objectives'. This recommendation is made since an 'evaluation' of BAF may include an assessment of BAF that the report already recommends: i.e., an assessment of the time path of carbon stock changes associated with the calculation of BAF_T in order to consider policy scenarios at shorter time scales than the longer time horizon used for the calculation of BAF_T. The draft report notes the following: "we note that both BAF measures (BAF_T and BAF_{2T}) should be calculated for varying levels of T to examine their time paths"

As noted on page iii of the cover letter, the draft report emphasizes the importance of clearly differentiating policy from scientific considerations in evaluating BAFs.

“It is important to clearly differentiate policy from scientific considerations in evaluating BAFs. BAF calculations are fundamentally a carbon accounting activity of expected future changes in carbon stocks due to increases in demand for bioenergy. BAFs and their evaluation should therefore be carbon science-based and derived to assess the implications of policy decisions on carbon stocks. Policy concerns about climate change should be addressed through the selection of appropriate policies and policy targets for greenhouse gas reduction. The stringency of greenhouse gas reduction policy targets should not affect the methods and time-scale used to calculate BAFs.”

The draft report notes that the SAB would have benefited from the agency laying out a specific context for the SAB to consider in order to assess the pros and cons of a proposed framework. The panel defines these choices by the EPA as the ‘policy context’ under which the panel sought to assess EPA’s framework. As noted in the draft report,

“the Framework needs to be applied in a specific policy context with specific BAF calculations and clearly defined boundaries for EPA’s regulatory authority. (cover letter p. 2, lines 19-20).

Also, under the Executive Summary’s “Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)”, the fourth paragraph notes:

“In selecting the time horizon, T, it is important to clearly differentiate scientific criteria from policy considerations. BAF calculations are fundamentally a carbon accounting tool to measure expected future changes in carbon stocks due to increases in demand for bioenergy. Therefore, BAFs should be carbon science based and derived to inform policy decisions on potential biophysical carbon implications. Concerns about the impacts of carbon emissions on the climate or other systems (e.g., oceans) should affect the choice of policy, such as emissions caps, carbon pricing and technology standards, as well as the stringency of the carbon mitigation targets. As explained in the sections below, we suggest two alternatives for calculating cumulative BAFs, both of which would use the time horizon that incorporates the large majority of effects over time. We do not believe that carbon science supports selecting the time horizon for evaluating calculating a BAF to fit a policy horizon (the EPA’s so-called “assessment horizon”). Rather the time horizon should be chosen to capture nearly all (e.g., >95%) of carbon stock effects and be the same across all feedstocks, regions, and all policies. Using the same time horizon for different feedstocks and regions allows one to compare the BAF across regions and feedstocks and will provide incentives to use low carbon feedstocks in all regions. The choice of this time horizon should not differ from one administration to the next or from one policymaker to the next.”

Section 3.5 of the draft report, under “General Comments on the Time Horizon for BAF Evaluation”, reiterates the above paragraph’s statements regarding how BAFs should be carbon science based and how such BAFs would inform policy decisions. This section

Commented [HE3]: Recommend this change, since the issue is calculation of BAF not how it is ‘evaluated’. Relates to earlier comment noting since an ‘evaluation’ of BAF may include an assessment of BAF that the report already recommends: i.e., an assessment of the time path of carbon stock changes associated with the calculation of BAF_T in order to consider policy scenarios at shorter time scales than the longer time horizon used for the calculation of BAF_T.

Commented [HE4]: Recommend removal of this sentence since it is an inflammatory, unscientific statement that does not seem necessary to be made to support the earlier scientific statements in the paragraph. Earlier in the paragraph, the text notes that “We do not believe that carbon science supports selecting the time horizon for evaluating a BAF to fit a policy horizon (the EPA’s so-called “assessment horizon”). This text makes the point why the e text then describes why the time horizon should capture nearly all carbon stock effects.

also makes explicit statements that clarify the intent to differentiate policy considerations from science:

“During our deliberations, we realized that it is important to clearly differentiate policy from scientific considerations. We also realized a number of public commenters were discussing climate impacts and intertemporal tradeoffs in these impacts, whereas our task was to account for effects of biogenic feedstocks on carbon stocks---literally, tons of carbon added to or removed from the atmosphere. BAF calculations are fundamentally a carbon accounting activity based on expected future changes in carbon stocks due to increases in biomass demand for energy. Therefore, BAFs should be carbon-science based and derived to inform policy decisions on potential physical carbon implications. Climate policy concerns and intertemporal tradeoffs are independent considerations that should affect the selection and stringency of policy tools that directly target greenhouse gas emissions. Such policy tools include emissions caps, technology standards, efficiency standards, carbon pricing and other approaches. All of these policy tools can be adjusted to meet a particular timeline of emissions reductions or reflect changing policy perceptions of climate risk. However, the BAF values should be unaffected.”

In addition, the Executive Summary, under “Importance of the Policy Context”, first and second paragraphs, also clarifies how a specific policy context would assist the SAB in providing its advice:

“The question before the agency and hence the SAB, was whether and how to consider biogenic greenhouse gas (GHG) emissions in reaching thresholds for permitting and decisions about BACT for CO₂ emissions from bioenergy. The agency has removed this policy context from its 2014 Framework and the EPA’s charge questions seek general guidance on issues related to the choice of temporal, spatial and production scale for determining Biogenic Assessment Factors (BAFs) in a policy-neutral context. This change hampered the ability of the SAB to assess the suitability of the 2014 Framework for use as a science-based regulatory framework. While some of our responses may be robust to multiple policy and implementation choices, we do not know without specific contexts such as the choice of BAF metric and time scale. In fact, the lack of information in both Frameworks on how the EPA may use potential BAFs made it difficult to fully evaluate these frameworks. As we stated in our 2012 report and we reiterate here: this SAB review would have been enhanced if the Agency offered a specific regulatory application that, among other things, provided explicit proposed BAF calculations and defined its legal boundaries regarding upstream and downstream emissions in the feedstock life cycles.

A policy context would also be helpful in clarifying if the purpose of performing carbon accounting with the proposed Framework is to account for the emissions of all greenhouse gases.”

Section 3.1 of the draft report, under the “Overarching Comments” section, further describes the purposes and reasoning for why the SAB sought a policy context within which the SAB could provide its scientific advice.

Reviewer 1:

Given that the accounting for biogenic greenhouse gas emissions is heavily influenced by the temporal dimension and there is no scientific basis for selecting one time frame over another independent of a clear statement of the desired goal, the revised report provides little insight into the fundamental science central to the issues being addressed.

Response:

The scientific basis for SAB's advice that recommends selection of a longer-scale time frame is described within the draft report, as discussed further below. The draft report notes that the purpose of this framework is to account for the carbon emissions generated by a stationary facility using biogenic feedstocks. Since these emissions have a temporal dimension and the impact of the additional demand for biomass plays out over a period of time, it would be appropriate to account for all of these effects over time rather than truncating the estimation at an arbitrary time horizon. Based on carbon science, we show that the net biogenic effect varies over time and can be positive or negative. As a result, the BAF of a feedstock can also be expected to vary over time. Our recommendation for time T is the point at which the NBE from an additional demand for biomass (from all feedstocks in the policy scenario) has stabilized so that all positive and negative effects are accounted for. ~~There is no scientific basis for choosing a shorter time horizon than that we are aware of.~~ We are not aware of any scientific basis for choosing a shorter time horizon for the calculation of BAF_T. ~~If~~ the reviewers are aware of science to support the use of a shorter time horizon for estimating BAF_T, we would be happy to hear about it.

Commented [HE5]: Rather than making a declaration that such science does not exist, recommend this rewording since it supports the next sentence's request for the reviewers to provide such science if it exists.

Within the draft report, as previously requested by the reviewers we have discussed the cons of choosing alternative values of T shorter than the timeframe that the Panel recommends. As described in the draft report under the Executive Summary's "Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)", third paragraph "A key charge question...":

"By arbitrarily selecting a shorter time horizon than recommended by the panel, the cumulative effects on carbon stock would be truncated, and could be over-estimated or under-estimated relative to those at the steady-state level. This could result in an upward or downward bias to the BAF." (See also page 2 of the cover letter within the following paragraph: "Using a carbon stock formulation...", and section 4.1, Temporal Scale for Biogenic Accounting", under the 'Charge Question 1' response, within the paragraph beginning "Using a carbon stock formulation...").

In addition, on page iii of the cover letter, the draft report notes that cumulative BAF that aggregates effects over time would provide estimates of cumulative emissions that have been shown to affect climate. The cover letter notes that:

"The choice of appropriate cumulative BAF metric should be informed by a scientific assessment of the dynamics of additions to atmospheric carbon stocks and mechanisms by which changes in atmospheric carbon stocks affect the

climate and other ecosystem functions, such as ocean acidification. For one of these effects, namely global temperature, we cite studies showing that it is likely to be affected by cumulative emissions over a long time period and that it is not likely to differ much across different scenarios of emissions pathways over the next several decades as long as there are equivalent cumulative emissions in the long run. The climate effect of cumulative changes in carbon stocks in the long run is therefore likely to be captured by EPA's cumulative BAF while the effect of transitional changes in carbon stock in the near term on the climate is more likely to be captured by the second cumulative BAF alternative. "

The carbon science underlying our recommendations is discussed in the Appendices A-E, in Mark Harmon's Comment. The figures in the text are based on the technical material presented in the appendices to illustrate the various cases that can arise and their implications for BAFs.

The draft report further notes, under Section 3.2, "Future Anticipated Baseline Approach", that a reference point baseline approach where a shorter time frame is considered is inadequate in cases where feedstocks accumulate over long time periods because it does not estimate the *additional* effect of a stationary facility's combustion of biomass on carbon emissions over time. The draft report provides reasons that support a longer-term timescale due to the need to assess growth of forest biomass, carbon sequestration, and land use changes. The draft report notes in this section that:

"In the case of long rotation feedstocks, bioenergy demand can affect carbon stocks in many ways including the harvest ages of trees, the diversion of forest biomass from traditional forest product markets to bioenergy and rates of afforestation and deforestation. Estimating the net effect of these changes on carbon stocks requires a model that integrates market demand and supply conditions with biophysical conditions that determine growth of forest biomass, losses via decomposition, carbon sequestration and fluxes due to harvests and land use change and incorporates the spatial variability in these effects across the U.S. (see section 3.2, "Future Anticipated Baseline Approach", second paragraph).

In addition, as further described in the second to last paragraph of the response to Charge Question 1(c), the draft report also expresses the need for caution in conducting modeling efforts that project into the future:

With either approach to evaluating BAF, caution is advised with projections into the future. For example, a BAF calculation is based on modeling that employs two assumptions: (1) it assumes feedstock regrowth following an assumed rotation length; and (2) it assumes that carbon sequestered in soils would continue indefinitely. Given the uncertainty about the maintenance of our forests and agricultural land use policies and practices, the BAF needs to be updated periodically to reflect the latest data and trends. A one-time cumulative BAF will need to be revised periodically to reflect changing conditions. Therefore, the model used to determine the BAF needs to be updated and validated periodically to ensure that the underlying information on which it is based is still valid.

Additionally, the likelihood of a cumulative BAF being realistic also depends on other policies in place that encourage or, at least, do not discourage long term sustainable land and forest management.

While the SAB recommends that BAF be calculated for a long time period, the SAB recognizes that the agency may want to assess ~~BAF at shorter time scales~~ the time path of carbon stock changes associated with the calculation of BAF_T in order to consider policy scenarios at shorter time scales than the longer time horizon used for the calculation of BAF_T . Therefore, page (iii) of the cover letter further states that: “*Although we recommend that the BAF be calculated for a time horizon long enough to account for the large majority of changes in terrestrial carbon stocks, we note that both BAF measures (BAF_T and $BAF_{\Sigma T}$) should be calculated for varying levels of T to examine their time paths. If the time path of carbon stock changes between the references and policy scenarios is of particular interest, then the second alternative cumulative BAF will provide this information for any time horizon of interest.*” (See also the Executive Summary’s “Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)” discussion, last paragraph beginning “Both cumulative BAFs...”)

Commented [HE6]: Recommend this change since the report’s recommendation is narrowly focused on asking EPA to assess the time path of carbon changes as they calculate BAF.

Reviewer 1:

The report is written as if the only greenhouse gas accounting being done with respect to greenhouse gas emissions across the economy is from biogenic emissions, yet that is certainly not the case. This is relevant as central to the usefulness of the report is being able to use the science in the context of the larger set of questions being addressed relative to greenhouse gas emissions from a diversity of sources.

Response: The framework that we were charged to review is focusing only on accounting of greenhouse gas emissions from biogenic sources. We were not asked to review methods to account for greenhouse gas emissions from other sources. This was stated on page i of the cover letter to the Administrator:

“The purpose of the 2014 Framework is to develop a method for calculating the adjustment, or Biogenic Assessment Factor (BAF), for carbon emissions associated with the combustion of biogenic feedstocks taking into account the biological carbon cycle effects associated with their growth, harvest, and processing. This mathematical adjustment to stack emissions is needed because of the unique ability of biogenic material to sequester CO₂ from the atmosphere, in biomass and soil, over time frames of years or decades through the process of photosynthesis. The BAF is an accounting term developed in the Framework to denote the offset to total emissions (mathematical adjustment) that reflects a biogenic feedstock’s net carbon emissions after taking into account its sequestration of carbon, in biomass or soil, or emissions that might have occurred with an alternate fate had it not been used for fuel.”

The draft report notes in various locations that other sources of emissions would need to be considered for emissions accounting consistency across all fuel types (e.g., see Executive Summary under “Alternate Fate approach for Waste-Derived Feedstocks”; Section 3.1 “Policy Context”, paragraph 5; and Section 3.4, “Alternate Fate Approach for

Waste-Derived Feedstocks”). Also, the cover letter, p. i, notes: *“The purpose of the 2014 Framework is to develop a method for calculating the adjustment, or Biogenic Assessment Factor (BAF), for carbon emissions associated with the combustion of biogenic feedstocks taking into account the biological carbon cycle effects associated with their growth, harvest, and processing.”*

Reviewer 1:

The temporal considerations vary across these other greenhouse gas emission sources/decisions as well. If one extends the logic in the report to the treatment of time and assumptions of equilibrium to all emissions sources it leads to illogical conclusions.

Response: Please be specific. We cannot follow your train of logic here. As stated above this framework is unique to facilities using biogenic feedstocks and is not intended to be applied to emissions sources that are not using biogenic feedstocks.

As discussed in the Executive Summary’s section on “Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1), the draft report recognizes there are varying BAFs at varying times for biogenic sources, and recommends that EPA calculate the BAFs for other time periods that may be of interest. The draft report makes no statement that extends this recommendation to analyses on other emissions sources, because the focus of the draft report is on biogenics.

Reviewer 1:

This variation is evident even among biogenic feedstocks, with mill residues having a very different temporal dimension than southern forest harvesting residues and again different from residues in the northwest where standard practices is to burn a lot of this material.

Response: Yes, these feedstocks have different temporal profiles and the different temporal profiles will be accounted for in the framework suggested here. The draft report notes that even though all feedstocks have the same T, their BAFs at that time T can be very different. Mill and forest residues that decay anyway will likely have a much smaller BAF than long rotation feedstocks.

Specifically, in Section 4.1, within the response to charge question 1, last paragraph, the draft report notes: *“Because various feedstocks might have different response times, the dynamics of the time varying effects of a feedstock on carbon stocks may play out over different temporal scales for different feedstocks and regions. Integrating multiple feedstocks within and among regions would require some method of standardization.”* Also, in Section 4.2, in the response to Charge Question 2b, the text notes that *“If the EPA’s goal is to obtain a region-specific BAF for a feedstock, it will be necessary to project region-specific, feedstock-specific demand for biomass. Since the BAF for a feedstock could differ depending on the method of production (for example, the soil carbon implications of corn stover will depend on the type of tillage practice used and the amount of residue harvested), it will be appropriate to have the BAF for a feedstock in a region vary by feedstock production method.”*

Reviewer 1:

Bottom line I do not think the current report advances our understanding of the fundamental science and in fact confuses things to a degree that I could not support approving the report. I do not know the options for how to move forward, but this revised draft falls well short of addressing the concerns the SAB raised the better part of a year ago with the subcommittee.

Reviewer 2:

As noted in my comments on the report from last week, I was concerned that the updates to the Biogenic Carbon report would not satisfy at least some people on the SAB.

During our group call, we had all discussed edits that would emphasize that a BAF could be assessed at any time period t , and that the BAF would differ depending on the selected time period.

Response: Yes, the BAF will differ, depending on the selected time period, as we emphasized on p (iii) of the cover letter, and in the Executive Summary's "Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)" discussion, last paragraph beginning "Both cumulative BAFs...":

"Although we recommend that the BAF be calculated for a time horizon long enough to account for the large majority of changes in terrestrial carbon stocks, we note that both BAF measures (BAF_t and $BAF_{\Sigma T}$) should be calculated for varying levels of T to examine their time paths."

In Section 4.1, "Temporal Scale for Biogenic Accounting", in the response to Charge Question 1, the seventh paragraph notes the following:

"Using a carbon stock formulation, we show below how the estimate of cumulative BAF is affected by the time horizon over which the carbon impact is computed. This is because the estimate of net biogenic emissions, defined as the difference in stocks of carbon between the reference (baseline) scenario and the policy scenario, varies with the time horizon."

Also, Figures 3 and 4 illustrate cases where BAF is increasing, decreasing or increasing and then decreasing over time.

Reviewer 2:

As noted by Bill below, this implies (in general) that biogenic carbon can be a net source of CO₂ in the short run and potentially neutral in the long-run.

Response: This is one of the illustrative cases, as shown in Figure 4 of the draft report. In fact as shown in the illustration of a decreasing carbon case, net carbon stocks are always lower in the policy scenario compared to the reference case in this illustration.

Reviewer 2:

Within that context, one could also note that "long run" BAFs that capture all (or most) positive and negative effects would likely be most relevant for long-run climate changes, but that

“shorter-run” BAFs could be relevant for other purposes (or something like that – as you know I’m not a climate expert).

Response: Whether a longer run or a shorter run BAF should be used is a policy decision. We do not have a scientific rationale to support the shorter-run BAFs. See further discussion on this topic in the draft report under the Executive Summary’s “Temporal Scale and the Future Anticipated Baseline Approach (Charge Question 1)”, third paragraph “A key charge question...”; on page 2 of the cover letter within the following paragraph: “Using a carbon stock formulation...”; and in section 4.1, Temporal Scale for Biogenic Accounting”, under the ‘Charge Question 1’ response, within the paragraph beginning “Using a carbon stock formulation...” We also recommend, in the cover letter, page iii, that a cumulative BAF that aggregates effects over time rather than an annual BAF that measures carbon stock effects at a point in time, noting that it is cumulative emissions that have been shown to affect climate.

Reviewer 2:

I’m not as concerned about this issue as others on the SAB, and am more amenable to the approach taken by the panel. Nonetheless, as Bill notes below, the updated report does still retain aspects that are likely to be objectionable to some on the SAB. For example, the report still strongly argues that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. It seems as if the panel is fairly adamant about supporting this “long run” BAF—and this is the very issue that is a problem for others on the SAB. I’m not sure how to get beyond this impasse.

Response: We want to clarify that while we say that T should selected as the time when the NBE has stabilized, we are not claiming that this will necessarily take a ‘long run’ to occur. In Section 4.1, “Temporal Scale for Biogenic Accounting”, in the response to Charge Question 1, the sixth paragraph notes the following:

“Several factors determine when the difference in carbon stocks between the reference and the policy scenario stabilizes, an indication that T has been reached (Appendices B, C, D). A major factor is the “speed” with which carbon stocks respond after harvest; this is determined, for example, by the speed with which a feedstock regrows and can be harvested again, the mix of feedstocks produced and the rate at which soil carbon stocks change. Thus the mix of feedstocks that are demanded by stationary facilities can influence the time horizon T. Other factors could include the scale of the demand for biogenic feedstocks, the rate at which that demand will grow in the future and the anticipation period available to landowners during which they can plan to meet expected demand. In addition, system response time could also be determined by underlying changes in the environment, particularly if those changes interact more with the policy scenario than the reference scenario (see Cases 4 and 5 in Appendix D).”

Reviewer 2:

I've viewed my primary role in this quality review as trying to find some compromise or middle-ground that will satisfy both the panel and others on the SAB, and I'm still hopeful that this can be achieved. But I'm not sure the best way forward from here.

Reviewer 3:

I am most unhappy with the current, revised version of the Biogenic Carbon Report. There have been some "band-aid" fixes to the earlier version, but this revision (at best) muddles the issue of the time frame. On the one hand, it says that time frame is a policy issue (not a science issue) but on the other hand it perpetuates the use of a 100-year time frame, which is said to represent "equilibrium" conditions.

Response:

First, we differentiate between the time frame for assessing a BAF and the climatological time frame over which carbon stocks drive global temperature changes. The Panel offered its scientific input on the former and cited studies on the latter. In general, the Panel believes the science supports calculating a BAF over a time period that incorporates ~~all effects~~ nearly all (e.g., >95%) of carbon stock effects. We do not say that a 100-year time frame is needed to reach equilibrium.

The draft report consistently recommends that EPA use a time horizon to calculate cumulative BAFs that captures nearly all (>95%) of positive and negative effects on carbon stock over time. It also recommends that BAFs for varying levels of T should also be calculated to provide information on how cumulative BAF might change for time periods of particular interest.

As noted on page iii of the cover letter, and Section 3.5 of the draft report (General Comments on the Time Horizon for BAF Evaluation), the draft report emphasizes the importance of clearly differentiating policy from scientific considerations in evaluating BAFs.

"It is important to clearly differentiate policy from scientific considerations in evaluating BAFs. BAF calculations are fundamentally a carbon accounting activity of expected future changes in carbon stocks due to increases in demand for bioenergy. BAFs and their evaluation should therefore be carbon science-based and derived to assess the implications of policy decisions on carbon stocks. Policy concerns about climate change should be addressed through the selection of appropriate policies and policy targets for greenhouse gas reduction. The stringency of greenhouse gas reduction policy targets should not affect the methods and time-scale used to calculate BAFs."

Reviewer 3:

The use of biogenic carbon in stationary sources is a hot issue, both in Europe and the U.S. I was expecting that this report would deliver a clear and concise message showing that such carbon is a net source of CO₂ to the atmosphere in the short run and potentially neutral in the long-run.

Response: The ecological-economic modeling does not necessarily support this prediction (that biogenic carbon will increase atmospheric carbon levels in the short run and will be neutral in the long run). Several cases are possible as shown in Figure 3 and 4. Biogenic carbon could be a net source or a net sink for carbon in the short run and vice versa in the long run. This can only be determined after the modeling exercise is completed. Our simple illustrations in the report show that any of these cases is possible.

We were asked to review a framework and not to show whether or not its use would show that biogenic feedstocks are a net source of CO₂ in the short run vs long run. The framework developed by EPA and our suggestions will result in BAFs being different across feedstocks and regions. Whether a feedstock ends up being a net source or a sink for carbon can only be determined after the modeling is done.

Reviewer 3:

Unfortunately, this revision does not deliver that message correctly, nor in a form that can be easily understood by even the interested reader.

At this point, I am not sure what course of action is best, but I will argue that this report should not be delivered to the administrator as representing the SAB.

Response: Recommend discussion this comment with the reviewer.

Reviewer 4:

Attached please find a copy of the Biogenic Carbon report with a few minor comments (added in the margin). I don't have any major concerns, although I do wonder whether the changes will satisfy some on the SAB who were strongly pushing for a report that did not specify that a long time frame should be used for BAF calculations. The current report does seem to "double down" on the argument that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. I agree with this argument, and think that the report is correct in this regard. However, I wonder whether it will satisfy some on the SAB.

My primary substantive question relates to BAFs and feedstocks – see my comment on the response to charge question 1(a). Specifically, the report indicates that for certain types of biomass such as agricultural crops, the time horizon over which all positive/negative carbon effects might occur is likely to be short, while for others (forests) it is likely to be longer. Doesn't that imply that the temporal scale for scientific consideration of carbon stock changes is feedstock dependent.

Response: We are saying that the T should not vary across feedstocks. However, with the same T, the BAF can and should vary across feedstocks.

As noted in the last paragraph of the response to Charge question 1, the draft report notes: *"Because various feedstocks might have different response times, the dynamics of the time varying effects of a feedstock on carbon stocks may play out over different temporal scales for different feedstocks and regions. Integrating multiple feedstocks within and among regions would require some method of standardization."* Also, the response to

Charge Question 2b notes that *“If the EPA’s goal is to obtain a region-specific BAF for a feedstock, it will be necessary to project region-specific, feedstock-specific demand for biomass. Since the BAF for a feedstock could differ depending on the method of production (for example, the soil carbon implications of corn stover will depend on the type of tillage practice used and the amount of residue harvested), it will be appropriate to have the BAF for a feedstock in a region vary by feedstock production method.”*

Reviewer 4:

However, in the response to charge question 1(a), the statement is made that the BAF should NOT be feedstock dependent. What am I missing? Perhaps this seeming discrepancy could be clarified somewhere. For example, if you are only using corn stover as biomass, wouldn’t the effective BAF be different than if you were only using hardwood as biomass (because all the positive and negative effects of using corn stover at t=0 would stabilize much sooner...)? My guess is that this can probably be clarified with a few sentences somewhere.

Response: The response to charge question 1(a) notes that the time horizon, T for scientific consideration of carbon stock changes should be chosen to capture nearly all of the effects on carbon stocks over time and it should not vary by policy, feedstock or landscape conditions. This will allow comparability of BAFs across feedstocks, policies and regions and provide uniform incentives to stationary facilities to use feedstocks with relatively lower BAFs.

Reviewer 4:

Finally, please note that the report does still contain a reference to the 100-year time frame (page 6 in the version with changes tracked): “Climate focused studies conclude that it is cumulative emissions over roughly a 100-year period that determine the climate response and that different emissions pathways with the same cumulative emissions are likely to produce to a similar global temperature response.” Note that no citations are provided to these studies.

Response: The SAB Staff Office (unfortunately) has a policy against citations in an Executive Summary but there are two studies showing this. Allen, et. al. 2009. Warming Caused by Cumulative Carbon Emissions toward the Trillionth Tonne. Nature, 1163-1166 and Matthews, et. al. 2009. The Proportionality of Global Warming to Cumulative Carbon Emissions. Nature. 829-832. We can add back the references.

I suggest that if you wish to include this, then references to these studies should be included to bolster the claim. However, I’m not sure why this sentence needs to be included at all. Why not drop it? It seems that any mention of a 100-year time frame – even an indirect one such as this – is likely to draw the ire of some SAB members.

Response: Not sure that’s a good reason to exclude science.

It's fine with me to include this statement (as long as appropriate citations are provided) – however, it might cause unnecessary consternation among some on the SAB.

Other than that, all of my comments are quite minor. There are a number of typos in the report (I have identified a number of them). I'm sure these will be ironed out in the final editing process.

Response: No response to this comment.

April 18, 2017

pg. 1

Lead Reviewer Comments on the Biogenic Carbon Emissions Report Revisions

- 1) I find the revised report unresponsive to the issues raised by the SAB. While the report brings forward an accounting framework that would allow the selection of a time frame to be made by policymakers, it does so without retreating from their earlier prescriptive framing. The result is increased confusion and co-mingling of solid science and policy proscription/pronouncements/framing.

Please cite statements in the report where you believe the Panel co-mingled science and policy.

On page 18-19 we have state the following to clearly distinguish between the scientific basis for determining T from the policy horizon that could be used to set T. As previously requested by the reviewers we have also discussed the pros and cons of choosing alternative values of T shorter than the one recommended below.

As discussed above, the time horizon, T for scientific consideration of carbon stock changes should be chosen to capture nearly all of the effects on carbon stocks over time and it should not vary by policy, feedstock or landscape conditions. This will allow comparability of BAFs across feedstocks, policies and regions and provide uniform incentives to stationary facilities to use feedstocks with relatively lower BAFs. We recognize that policy may be focused on a time horizon different from T. **However, the BAF on its own is not a policy tool.** It is an estimate of net emissions (tons of carbon) adjusted for carbon sequestration and alternate fates, not a full life cycle accounting of biomass use. **Climate policy objectives should drive policy stringency and not influence the choice of T.** Policy tools that directly target greenhouse gas reductions include emissions caps, technology standards, efficiency standards and carbon pricing. Timelines for reducing greenhouse gas emissions can be achieved by the selection and design of these policy tools. **BAF evaluations should be science based and immune to policy objectives and politics, including changes in administrations.**

On page 4 we have stated that: By arbitrarily selecting a shorter time horizon than this, the cumulative effects on carbon stock would be truncated, and could be over-estimated or under-estimated relative to those at the steady-state level. This could result in an upward or downward bias to the BAF.

Page 4 and page 16

In selecting the time horizon, T, it is important to clearly differentiate scientific criteria from policy considerations. BAF calculations are fundamentally a carbon accounting tool to measure expected future changes in carbon stocks due to increases in demand for bioenergy. Therefore, BAFs should be carbon science based and derived to inform policy decisions on potential biophysical carbon implications. Concerns about the impacts of carbon emissions on the climate or other systems (e.g., oceans) should affect the choice of policy, such as emissions caps, carbon pricing and technology standards, as well as the stringency of the carbon mitigation targets. As explained in the sections below, we suggest two alternatives for calculating cumulative BAFs, both of which would use the time horizon

that incorporates the large majority of effects over time. We do not believe that carbon science supports selecting the time horizon for evaluating a BAF to fit a policy horizon (the EPA's so-called "assessment horizon"). Rather the time horizon should be chosen to capture nearly all (e.g., >95%) of carbon stock effects and be the same across all feedstocks, regions, and all policies. Using the same time horizon for different feedstocks and regions allows one to compare the BAF across regions and feedstocks and will provide incentives to use low carbon feedstocks in all regions. The choice of this time horizon should not differ from one administration to the next or from one policymaker to the next.

On page (ii) we note that

"It is important to clearly differentiate policy from scientific considerations in evaluating BAFs. BAF calculations are fundamentally a carbon accounting activity of expected future changes in carbon stocks due to increases in demand for bioenergy. BAFs and their evaluation should therefore be carbon science-based and derived to assess the implications of policy decisions on carbon stocks. Policy concerns about climate change should be addressed through the selection of appropriate policies and policy targets for greenhouse gas reduction. The stringency of greenhouse gas reduction policy targets should not affect the methods and time-scale used to calculate BAFs. "

On page (iii) we state that: "Although we recommend that the BAF be calculated for a time horizon long enough to account for the large majority of changes in terrestrial carbon stocks, we note that both BAF measures (BAF_T and $BAF_{\Sigma T}$) should be calculated for varying levels of T to examine their time paths."

Given that the accounting for biogenic greenhouse gas emissions is heavily influenced by the temporal dimension and there is no scientific basis for selecting one time frame over another independent of a clear statement of the desired goal, the revised report provides little insight into the fundamental science central to the issues being addressed.

The purpose of this framework is to account for the carbon emissions generated by a stationary facility using biogenic feedstocks. Since these emissions have a temporal dimension and the impact of the additional demand for biomass plays out over a period of time, it would be appropriate to account for all of these effects over time rather than truncating the estimation at an arbitrary time horizon. Based on carbon science, we show that the net biogenic effect varies over time and can be positive or negative. As a result, the BAF of a feedstock can also be expected to vary over time. Our recommendation for time T is the point at which the NBE from an additional demand for biomass (from all feedstocks in the policy scenario) has stabilized so that all positive and negative effects are accounted for. There is no scientific basis for choosing a shorter time horizon than that we are aware of. If the reviewers are aware of science to support the use of a shorter time horizon for estimating BAF we would be happy to hear about it.

The report is written as if the only greenhouse gas accounting being done with respect to greenhouse gas emissions across the economy is from biogenic emissions, yet that is certainly not the case. This is relevant as central to the usefulness of the report is being able to use the science in the context of the larger set of questions being addressed relative to greenhouse gas emissions from a diversity of sources.

The framework that we were charged to review is focusing only on accounting of greenhouse gas emissions from biogenic sources. We were not asked to review methods to account for greenhouse gas emissions from other sources. This was stated on page (1) of the letter to the administrator

“The purpose of the 2014 Framework is to develop a method for calculating the adjustment, or Biogenic Assessment Factor (BAF), for carbon emissions associated with the combustion of biogenic feedstocks taking into account the biological carbon cycle effects associated with their growth, harvest, and processing. This mathematical adjustment to stack emissions is needed because of the unique ability of biogenic material to sequester CO₂ from the atmosphere, in biomass and soil, over time frames of years or decades through the process of photosynthesis. The BAF is an accounting term developed in the Framework to denote the offset to total emissions (mathematical adjustment) that reflects a biogenic feedstock’s net carbon emissions after taking into account its sequestration of carbon, in biomass or soil, or emissions that might have occurred with an alternate fate had it not been used for fuel. “

The temporal considerations vary across these other greenhouse gas emission sources/decisions as well. If one extends the logic in the report to the treatment of time and assumptions of equilibrium to all emissions sources it leads to illogical conclusions. Please be specific. We cannot follow your train of logic here. As stated above this framework is unique to facilities using biogenic feedstocks and is not intended to be applied to emissions sources that are not using biogenic feedstocks.

This variation is evident even among biogenic feedstocks, with mill residues having a very different temporal dimension than southern forest harvesting residues and again different from residues in the northwest where standard practices is to burn a lot of this material. Yes, these feedstocks have different temporal profiles and the different temporal profiles will be accounted for in the framework suggested here. Even though all feedstocks have the same T, their BAFs at that time T can be very different. Mill and forest residues that decay anyway will likely have a much smaller BAF than long rotation feedstocks.

- 2) Bottom line I do not think the current report advances our understanding of the fundamental science and in fact confuses things to a degree that I could not support approving the report. I do not know the options for how to move forward, but this revised draft falls well short of addressing the concerns the SAB raised the better part of a year ago with the subcommittee.

The carbon science underlying our recommendations is discussed in the Appendices A-E, in Mark Harmon’s Comment. The figures in the text are based on the technical material presented in the appendices to illustrate the various cases that can arise and their implications for BAFs.

2) As noted in my comments on the report from last week, I was concerned that the updates to the Biogenic Carbon report would not satisfy at least some people on the SAB.

During our group call, we had all discussed edits that would emphasize that a BAF could be assessed at any time period t , and that the BAF would differ depending on the selected time period.

This is still the case, as emphasized on page 6, lines 5 – 6.

On page 18 we state

Using a carbon stock formulation, we show below how the estimate of cumulative BAF is affected by the time horizon over which the carbon impact is computed. This is because the estimate of net biogenic emissions, defined as the difference in stocks of carbon between the reference (baseline) scenario and the policy scenario, varies with the time horizon.

Figures 3 and 4 illustrate cases where BAF is increasing, decreasing or increasing and then decreasing over time.

As noted by Bill below, this implies (in general) that biogenic carbon can be a net source of CO₂ in the short run and potentially neutral in the long-run.

This is one of the cases, as shown in Figure 4— In fact as shown in the figures, net carbon stocks are always lower in the policy scenario compared to the reference case in this illustration.

Within that context, one could also note that “long run” BAFs that capture all (or most) positive and negative effects would likely be most relevant for long-run climate changes, but that “shorter-run” BAFs could be relevant for other purposes (or something like that – as you know I’m not a climate expert).

Whether a longer run or a shorter run BAF should be used is a policy decision. We do not have a scientific rationale to support the shorter-run BAFs. We also recommend a cumulative BAF that aggregates effects over time rather than an annual BAF that measures carbon stock effects at a point in time since it is cumulative emissions that have been shown to affect climate.

I’m not as concerned about this issue as others on the SAB, and am more amenable to the approach taken by the panel. Nonetheless, as Bill notes below, the updated report does still retain aspects that are likely to be objectionable to some on the SAB. For example, the report still strongly argues that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. It seems as if the panel is fairly adamant about supporting this “long run” BAF—and this is the very issue that is a problem for others on the SAB. I’m not sure how to get beyond this impasse.

We want to clarify that while we say that T should be selected as the time when the NBE has stabilized, we are not claiming that this will necessarily take a ‘long run’ to occur.

On page 18 we note

Several factors determine when the difference in carbon stocks between the reference and the policy scenario stabilizes, an indication that T has been reached (Appendices B, C, D). A major factor is the “speed” with which carbon stocks respond after harvest; this is determined, for example, by the speed with which a feedstock regrows and can be harvested again, the mix of feedstocks produced and the rate at which soil carbon stocks change. Thus the mix of feedstocks that are demanded by stationary facilities can influence the time horizon T. Other factors could include the scale of the demand for biogenic feedstocks, the rate at which that demand will grow in the future and the anticipation period available to landowners during which they can plan to meet expected demand. In addition, system response time could also be determined by underlying changes in the environment, particularly if those changes interact more with the policy scenario than the reference scenario (see Cases 4 and 5 in Appendix D).

I’ve viewed my primary role in this quality review as trying to find some compromise or middle-ground that will satisfy both the panel and others on the SAB, and I’m still hopeful that this can be achieved. But I’m not sure the best way forward from here.

April 18, 2017

pg. 2

3) I am most unhappy with the current, revised version of the Biogenic Carbon Report. There have been some “band-aid” fixes to the earlier version, but this revision (at best) muddles the issue of the time frame. On the one hand, it says that time frame is a policy issue (not a science issue) but on the other hand it perpetuates the use of a 100-year time frame, which is said to represent “equilibrium” conditions.

I could not find where we have said the part in yellow

We have not said that a 100 year time frame is needed to reach equilibrium.

The use of biogenic carbon in stationary sources is a hot issue, both in Europe and the U.S. I was expecting that this report would deliver a clear and concise message showing that such carbon is a net source of CO₂ to the atmosphere in the short run and potentially neutral in the long-run.

We were asked to review a framework and now to show whether or not its use would show that biogenic feedstocks are a net source of CO₂ in the short run vs long run. The framework developed by EPA and our suggestions will result in BAFs being different across feedstocks and regions. Whether a feedstock ends up being a net source or a sink for carbon can only be determined he modeling is done

The ecological-economic modeling does not necessarily support this prediction. Several cases are possible as shown in Figure 3 and 4. Biogenic carbon could be a net source or a net sink for carbon in the short run and vice versa in the long run. This can only be determined after the modeling exercise is completed. Our simple illustrations in the report show that any of these cases is possible.

Unfortunately, this revision does not deliver that message correctly, nor in a form that can be easily understood by even the interested reader.

At this point, I am not sure what course of action is best, but I will argue that this report should not be delivered to the administrator as representing the SAB.

4) Attached please find a copy of the Biogenic Carbon report with a few minor comments (added in the margin). I don't have any major concerns, although I do wonder whether the changes will satisfy some on the SAB who were strongly pushing for a report that did not specify that a long time frame should be used for BAF calculations. The current report does seem to "double down" on the argument that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. I agree with this argument, and think that the report is correct in this regard. However, I wonder whether it will satisfy some on the SAB.

My primary substantive question relates to BAFs and feedstocks – see my comment on the response to charge question 1(a). Specifically, the report indicates that for certain types of biomass such as agricultural crops, the time horizon over which all positive/negative carbon effects might occur is likely to be short, while for others (forests) it is likely to be longer. Doesn't that imply that the temporal scale for scientific consideration of carbon stock changes is feedstock dependent? We are saying that the T should not vary across feedstocks. However, with the same T, the BAF can and should vary across feedstocks. However, in the response to charge question 1(a), the statement is made that the BAF should NOT be feedstock dependent. What am I missing? Perhaps this seeming discrepancy could be clarified somewhere. For example, if you are only using corn stover as biomass, wouldn't the effective BAF be different than if you were only using hardwood as biomass (because all the positive and negative effects of using corn stover at t=0 would stabilize much sooner...)? My guess is that this can probably be clarified with a few sentences somewhere.

Finally, please note that the report does still contain a reference to the 100-year time frame (page 6 in the version with changes tracked): "Climate focused studies conclude that it is cumulative emissions over roughly a 100-year period that determine the climate response and that different emissions pathways with the same cumulative emissions are likely to produce to a similar global temperature response." Note that no citations are provided to these studies. The SAB Staff Office (unfortunately) has a policy against citations in an Executive Summary but there are two studies showing this. Allen, et. al. 2009. Warming Caused by Cumulative Carbon Emissions toward the Trillionth Tonne. Nature, 1163-1166 and Matthews, et. al. 2009. The Proportionality of Global Warming to Cumulative Carbon Emissions. Nature. 829-832. We can add back the references. I suggest that if you wish to include this, then references to these studies should be included to bolster the claim. However, I'm not sure why this sentence needs to be included at all. Why not drop it? It seems that any mention of a 100-year time frame – even an indirect one such as this – is likely to draw the ire of some SAB members. Not sure that's a good reason to exclude science. It's fine with me to include this statement (as long as appropriate citations are provided) – however, it might cause unnecessary consternation among some on the SAB.

April 18, 2017

pg. 3

Other than that, all of my comments are quite minor. There are a number of typos in the report (I have identified a number of them). I'm sure these will be ironed out in the final editing process.

Message

From: Shallal, Suhair [Shallal.Suhair@epa.gov]
Sent: 9/7/2017 4:30:09 PM
To: Stallworth, Holly [Stallworth.Holly@epa.gov]; Zarba, Christopher [Zarba.Christopher@epa.gov]
Subject: RE: First Cut
Attachments: Biogenic Carbon_HS-ss.docx

See attached for my edits.

Sue

From: Stallworth, Holly
Sent: Thursday, September 07, 2017 11:22 AM
To: Zarba, Christopher <Zarba.Christopher@epa.gov>; Shallal, Suhair <Shallal.Suhair@epa.gov>
Subject: RE: First Cut

Ex. 5 Deliberative Process (DP)

From: Zarba, Christopher
Sent: Wednesday, September 6, 2017 4:52 PM
To: Stallworth, Holly <Stallworth.Holly@epa.gov>; Shallal, Suhair <Shallal.Suhair@epa.gov>
Subject: First Cut

I will keep working on it but there should be enough here to give you something to work from.

Thanks.

Christopher S. Zarba

US EPA Science Advisory Board
zarba.christopher@epa.gov
O (202) 564-0760
M (202) 731-6423

Lead Reviewer Comments on the Biogenic Carbon Emissions Report Revisions

- 1) I find the revised report unresponsive to the issues raised by the SAB. While the report brings forward an accounting framework that would allow the selection of a time frame to be made by policymakers, it does so without retreating from their earlier prescriptive framing. The result is increased confusion and co-mingling of solid science and policy proscription/pronouncements/framing. Given that the accounting for biogenic greenhouse gas emissions is heavily influenced by the temporal dimension and there is no scientific basis for selecting one time frame over another independent of a clear statement of the desired goal, the revised report provides little insight into the fundamental science central to the issues being addressed. The report is written as if the only greenhouse gas accounting being done with respect to greenhouse gas emissions across the economy is from biogenic emissions, yet that is certainly not the case. This is relevant as central to the usefulness of the report is being able to use the science in the context of the larger set of questions being addressed relative to greenhouse gas emissions from a diversity of sources. The temporal considerations vary across these other greenhouse gas emission sources/decisions as well. If one extends the logic in the report to the treatment of time and assumptions of equilibrium to all emissions sources it leads to illogical conclusions. This variation is evident even among biogenic feedstocks, with mill residues having a very different temporal dimension than southern forest harvesting residues and again different from residues in the northwest where standard practices is to burn a lot of this material. Bottom line I do not think the current report advances our understanding of the fundamental science and in fact confuses things to a degree that I could not support approving the report. I do not know the options for how to move forward, but this revised draft falls well short of addressing the concerns the SAB raised the better part of a year ago with the subcommittee.
- 2) As noted in my comments on the report from last week, I was concerned that the updates to the Biogenic Carbon report would not satisfy at least some people on the SAB.

During our group call, we had all discussed edits that would emphasize that a BAF could be assessed at any time period t , and that the BAF would differ depending on the selected time period. As noted by Bill below, this implies (in general) that biogenic carbon can be a net source of CO₂ in the short run and potentially neutral in the long-run. Within that context, one could also note that “long run” BAFs that capture all (or most) positive and negative effects would likely be most relevant for long-run climate changes, but that “shorter-run” BAFs could be relevant for other purposes (or something like that – as you know I’m not a climate expert).

I’m not as concerned about this issue as others on the SAB, and am more amenable to the approach taken by the panel. Nonetheless, as Bill notes below, the updated report does still retain aspects that are likely to be objectionable to some on the SAB. For example, the report still strongly argues that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. It seems as if the panel is fairly adamant about supporting this “long run” BAF—and this is the very issue that is a problem for others on the SAB. I’m not sure how to get beyond this impasse.

I’ve viewed my primary role in this quality review as trying to find some compromise or middle-ground that will satisfy both the panel and others on the SAB, and I’m still hopeful that this can be achieved. But I’m not sure the best way forward from here.

- 3) I am most unhappy with the current, revised version of the Biogenic Carbon Report. There have been some “band-aid” fixes to the earlier version, but this revision (at best) muddles the issue of the time frame. On the one hand, it says that time frame is a policy issue (not a science issue) but on the other hand it perpetuates the use of a 100-year time frame, which is said to represent “equilibrium” conditions.

The use of biogenic carbon in stationary sources is a hot issue, both in Europe and the U.S. I was expecting that this report would deliver a clear and concise message showing that such carbon is a net source of CO₂ to the atmosphere in the short run and potentially neutral in the long-run. Unfortunately, this revision does not deliver that message correctly, nor in a form that can be easily understood by even the interested reader.

At this point, I am not sure what course of action is best, but I will argue that this report should not be delivered to the administrator as representing the SAB.

- 4) Attached please find a copy of the Biogenic Carbon report with a few minor comments (added in the margin). I don’t have any major concerns, although I do wonder whether the changes will satisfy some on the SAB who were strongly pushing for a report that did not specify that a long time frame should be used for BAF calculations. The current report does seem to “double down” on the argument that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. I agree with this argument, and think that the report is correct in this regard. However, I wonder whether it will satisfy some on the SAB.

My primary substantive question relates to BAFs and feedstocks – see my comment on the response to charge question 1(a). Specifically, the report indicates that for certain types of biomass such as agricultural crops, the time horizon over which all positive/negative carbon effects might occur is likely to be short, while for others (forests) it is likely to be longer. Doesn’t that imply that the temporal scale for scientific consideration of carbon stock changes is feedstock dependent? However, in the response to charge question 1(a), the statement is made that the BAF should NOT be feedstock dependent. What am I missing? Perhaps this seeming discrepancy could be clarified somewhere. For example, if you are only using corn stover as biomass, wouldn’t the effective BAF be different than if you were only using hardwood as biomass (because all the positive and negative effects of using corn stover at t=0 would stabilize much sooner...)? My guess is that this can probably be clarified with a few sentences somewhere.

Finally, please note that the report does still contain a reference to the 100-year time frame (page 6 in the version with changes tracked): “Climate focused studies conclude that it is cumulative emissions over roughly a 100-year period that determine the climate response and that different emissions pathways with the same cumulative emissions are likely to produce to a similar global temperature response.” Note that no citations are provided to these studies. I suggest that if you wish to include this, then references to these studies should be included to bolster the claim. However, I’m not sure why this sentence needs to be included at all. Why not drop it? It seems that any mention of a 100-year time frame – even an indirect one such as this – is likely to draw the ire of some SAB members. It’s fine with me to include this statement (as long as appropriate citations are provided) – however, it might cause unnecessary consternation among some on the SAB.

April 18, 2017

Other than that, all of my comments are quite minor. There are a number of typos in the report (I have identified a number of them). I'm sure these will be ironed out in the final editing process.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON D.C. 20460

OFFICE OF THE ADMINISTRATOR
EPA SCIENCE ADVISORY BOARD

MEMORANDUM

DATE

FROM: Madhu Khanna, Chair /s/
Biogenic Carbon Emissions Panel

TO: Biogenic Carbon Emissions Panel

SUBJECT: Revised draft of Panel's report

Attached please find a new draft of our biogenic carbon emissions report for your review. Since our teleconference on October 12, 2016, we've been working to address comments of the SAB reviewers and we made revisions as follows.

- We have clarified that it is important to distinguish science from policy, and BAFs should be science-based and unaffected by policy goals. Climate policy goals should instead be reflected in the stringency of policies (e.g., emissions caps, emissions standards, carbon taxes), and BAFs should be immune to changes in administrations and agendas.
- We have clarified that computing BAFs is a scientific carbon accounting exercise and science provides guidance for identifying capital T, the time when expected changes in carbon stocks (between the reference and the policy scenario) due to increased demand for bioenergy stabilize (or reach a new steady state equilibrium). Furthermore, choosing a time horizon shorter than that supported by science (T) has implications for truncating expected carbon stock changes and could under- or overestimate the value of BAF compared to the level at time T. Additionally, we note (as before) that considering cumulative changes in emissions through T is appropriate as climate science suggests that it is changes in cumulative emissions that affect global mean temperature.
- We have addressed confusion about T and whether or not it should be 100-years by clearly noting that T should be determined with modeling analysis as described above and that we are not recommending a particular value for T. To avoid confusion, we no longer mention 100 years in the text and in certain figures.
- We have emphasized that the BAF will differ over time. It could be increasing or decreasing and $BAF_{\Sigma T}$ will be different from BAF_T .

I don't think any of these things are new to the Panel or depart from our previous consensus.

Upon further discussions with Mark Harmon who did a lot of additional analysis, we added a couple of additional points as follows.

- We have defined T as the time where *system-wide* differences in carbon stocks stabilizes. That horizon T should be applied for all feedstocks in a region. We have defined this time horizon T as the point where the “large majority” (>95%) of changes in carbon stocks occur to acknowledge the practical reality of most of the changes.
- We have added a brief discussion on spatial scale of analysis and appropriateness of the landscape view (supported by our recommendation for an integrated modeling approach to determine the BAF).
- Based on simulations conducted by Mark and shown in a new Appendix E we have also stated the BAF appears to be robust to spatial scale and initial conditions since it is the ratio of the *difference* in stocks in two different scenarios to Potential Gross Emissions.
- Appendix E shows the relationship between stand and landscape levels and provides an important insight that the BAF_T and $BAF_{\Sigma T}$ are insensitive to trends that affect both the policy and reference scenarios in the same manner. Mark’s analysis also illustrated the time trend in the estimate of BAF obtained using a landscape scale is very similar to that obtained using a stand level approach. This trend is also relatively invariant to whether the biomass is obtained from old growth forests or a forest managed as a plantation.

As a reminder, our goal is to provide revisions that are consistent with the science and respond to the SAB comments (which may be found posted at [[HYPERLINK "https://yosemite.epa.gov/sab/sabproduct.nsf/32ABE92AC616370185257F800076802A/\\$File/QR+members+comments+bio+emissions+032816.pdf"](https://yosemite.epa.gov/sab/sabproduct.nsf/32ABE92AC616370185257F800076802A/$File/QR+members+comments+bio+emissions+032816.pdf)]). I believe all of these points satisfy those criteria. There are numerous minor edits we made in response to SAB vetters’ comments however, given the difficulty of reading a track changes file, we did not add margin comments to explain each change.

I would like your feedback on these revisions by _____ (insert date). Please send me and Holly any comments by email. If any thorny issues arise, we can hold some subgroup calls to work through the revised language. As always, if I do not hear from you by _____, I will assume we have your approval.

Once we have a draft to forward to the SAB vetters, I will let you know. The chartered SAB will review our draft in a public teleconference yet to be scheduled.

I have attached a clean version and a “track changes” version made by merging our latest file with the file discussed in our October 12, 2016 teleconference.

My apologies for the long delay in getting these revisions to you. Thank you for your attention to this.

Dear Panel,

Attached please find a new draft of our biogenic carbon emissions report for your review. Since our teleconference on October 12, 2016, we've been working to address comments of the SAB reviewers and we made revisions as follows.

- We have clarified that it is important to distinguish science from policy, and BAFs should be science-based and unaffected by policy goals. Policy goals should instead be reflected in the stringency of policies (e.g., emissions caps, emissions standards), and BAFs should be immune to changes in administrations and agendas.
- We have clarified that computing BAFs is a scientific carbon accounting exercise and science provides guidance for identifying capital T, the time horizon when expected changes in carbon stocks (between the reference and the policy scenario) due to increased demand for bioenergy stabilize (or reach a new steady state equilibrium) at zero. Furthermore, choosing a time horizon different shorter than from that supported by what science supports (T) has implications for truncating expected carbon stock changes and could under- or overestimate the value of BAF compared to the level at time T_r, and Additionally we note (as before) that considering cumulative changes in emissions accounting for all future carbon stock changes through T is appropriate as climate science suggests that it is changes in cumulative carbon stock changes are what determine emissions that affect global mean temperature.
- We have addressed confusion about T and whether or not it should be 100-years by clearly noting that T should be determined with modeling analysis as described above and that we are not recommending a particular value for T at this point. To avoid confusion, we have deleted no longer mention of 100 years in the text and in certain figures.
- We have emphasized that the BAF will differ over time. It could be increasing or decreasing and BAF_T will be different from BAF_r .
- We have stated the BAF appears to be robust to scale and initial conditions since it is the ratio of the difference in stocks in two different scenarios to Potential Gross Emissions.

I don't think any of these things are new to the Panel or depart from our previous consensus. Upon further discussions with Mark, we added a couple of twists that are "new" so I'm listing them below as follows.

- We have defined T as the time where *system-wide* differences in carbon stocks stabilizes. That horizon T should be applied for all feedstocks in a region. We have also defined this time horizon T as the point where the "large majority" (>95%) of changes in carbon stocks effects occur to acknowledge the practical reality of most of the changes.
- We have added a brief discussion on spatial scale of analysis and appropriateness of the landscape view (supported by our recommendation for an integrated modeling approach to determine the BAF).

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- *-----Based on simulations conducted by Mark and shown in a new Appendix E stated that assessments of biogenic carbon in the literature have varied with the choice of spatial scale and initial conditions.
- * ~~We have also stated the BAF appears to be robust to spatial scale and initial conditions since it is the ratio of the difference in stocks in two different scenarios to Potential Gross Emissions.~~

- ~~We have added Appendix E shows the en the relationship between stand and landscape levels and provides an important insight that to underscore that the cumulative BAF T and BAF Sigma Ts are insensitive to trends that affect both the policy and reference scenarios in the same manner. Mark's analysis also illustrated the time trend in the estimate of BAF obtained using a landscape scale is very similar to that obtained using a stand level approach. This trend is also relatively invariant to whether the biomass is obtained from old growth forests or a forest managed as a plantation.~~

I would like your feedback on these revisions by _____ (insert date). Please send me any comments by email. We can hold some subgroup calls to trouble shoot any issues that may arise. As always, if I do not hear from you by _____, I will assume we have your approval. Once we have a draft to forward to the SAB vetters, I will let you know. The chartered SAB will review our draft in a public teleconference yet to be scheduled.

I have attached a clean version and a "track changes" version made by merging our latest file with the file discussed in our October 12, 2016 teleconference. There are numerous minor edits we made in response to SAB vetters' comments but we did not add margin comments to explain each change because it is already difficult enough to read.

My apologies for the long delay in getting these revisions to you and thank you for your attention to this.

Message

From: Ken Skog [kenskog@gmail.com]
Sent: 3/28/2017 6:20:24 PM
To: Stallworth, Holly [Stallworth.Holly@epa.gov]
Subject: Re: Revised Biogenic Carbon draft -- comments due March 31

Holly,

I see it's after 2 pm EDT so I will call you tomorrow, probably at 10 am your time.

Ken

On Tue, Mar 28, 2017 at 11:50 AM Stallworth, Holly <Stallworth.Holly@epa.gov> wrote:

Ken,

Thanks for your comments. Can you give me a ring about this? I'm in the office until 2pm today and back tomorrow for a full day.

Holly Stallworth, Ph.D.

Economist and Designated Federal Officer

Science Advisory Board Staff Office

Mail Code 1400 R

1300 Pennsylvania Ave., NW, Suite

Washington DC

Phone: 202-564-2073

From: Ken Skog [mailto:kenskog@gmail.com]
Sent: Monday, March 27, 2017 3:21 PM
To: Stallworth, Holly <Stallworth.Holly@epa.gov>
Subject: Re: Revised Biogenic Carbon draft -- comments due March 31

March 25, 2017

Holly and Madhu,

Thank you very much for your work in preparing the revised text.

I particularly appreciate and agree with several clarified and strong statements. I have suggestions for possible clarifications.

Thank you for your consideration of my suggested additions

Best Regards,
Ken

I use page and line numbers from the doc with track changes.

Topic 1

I agree with the strong statement on Pg iii (emphasis added) about policy targets not affecting the methods, and time scale to calculate BAF and restated on pgs 16 and 20.

“It is important to clearly differentiate policy from scientific considerations in evaluating BAFs. BAF calculations are fundamentally a carbon accounting activity of expected future changes in carbon stocks due to potential increases in demand for bioenergy. BAFs and their evaluation should therefore be carbon science-based and derived to assess the implications of policy decisions on carbon stocks. Policy concerns about climate change should be addressed through the selection of appropriate policies and policy targets for greenhouse gas reduction. The stringency of greenhouse gas reduction **policy targets should not affect the methods and time-scale used to calculate BAFs, just as it does not affect how the carbon intensity of fossil fuels is calculated.** “

I see this independence is asserted on pg 16 line 26 and pg 20 lines 8-16 . On pg 20 lines 15-16 how about dropping “to the extent possible.” It does not appear on pg iii.

Given this statement that **methods** should not be affected by policy it seems we should also clarify that the choice between BAF(t) or BAF(sigma t) should be decided separately from deciding on policy.

Suggestion: Add text in red below after p iii, lines 28-31 “The choice of appropriate cumulative BAF metric should be informed by a scientific assessment of mechanisms by which changes in atmospheric carbon stocks

affect the climate and other ecosystem functions, such as ocean acidification. We suggest that choice of BAF metric would be made independently of choice of policy.”

Since we are asserting key methods and time scale should be independent of policy it seems we should add a clarification in the policy context discussion on pg 1 and Recommendation 1 on pg 7.

Suggested change on pg 1 lines 27-28

“While some of our responses are robust to multiple policy and implementation choices **such as choice of BAF metric (formula?) and time scale** , others would have been more specific had such details been provided.”

Suggested change in Recommendation 1 on pg 7 lines 16-17 and pg 11 lines 8-11

For full scientific evaluation of a biogenic carbon accounting approach, beyond our recommendations for the basic form of the BAF metric and time scale, the EPA should specify a specific policy context in which BAFs will be used, propose specific BAF calculations and values, and specify its legal authorities over upstream and downstream emissions as well as the spatial boundaries for assessing emissions associated with a stationary facility.

Topic 2 - time scale for BAF

I think we have to go with our argument that the BAF time T should be until there is little further change (between scenarios) in C stocks. However, it seems choosing T based on little or no change in stocks is arbitrary given that we are trying to estimate effect on net emissions (BAF) not net change in stocks. What about choosing a BAF which is 95% of some ultimate BAF with T going out very far? What about a limitation on T due to uncertainty in projections?

Suggestion: Add a sentence after pg 19 line 29.

The selection of the time horizon for calculating BAF could also be limited if analysis indicates there is high uncertainty in further change in BAF with projections beyond a given year prior to year T.

End

On Mon, Mar 20, 2017 at 7:33 AM, Stallworth, Holly <Stallworth.Holly@epa.gov> wrote:

Panelists,

Enclosed please find a memo from our Panel Chair Madhu Khanna transmitting the revised draft of the biogenic carbon report. Comments are due by March 31. Attached is a clean version and a “track changes” version made by merging our latest file with the file discussed in our October 12, 2016 teleconference.

Thanks.

Holly Stallworth, Ph.D.

Economist and Designated Federal Officer

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON D.C. 20460

OFFICE OF THE ADMINISTRATOR
EPA SCIENCE ADVISORY BOARD

MEMORANDUM

April 4, 2017

FROM: Madhu Khanna, Chair /s/
Biogenic Carbon Emissions Panel

TO: William Schlesinger, Steve Hamburg and Robert Johnston

SUBJECT: Revised draft of Panel's report

Attached please find a new draft of our biogenic carbon emissions report for your review. Since our teleconference on October 12, 2016, we've been working to address comments of the SAB reviewers and we made revisions as follows.

- We have clarified that it is important to distinguish science from policy, and BAFs should be science-based and unaffected by policy goals. Climate policy goals should instead be reflected in the stringency of policies (e.g., emissions caps, emissions standards, carbon taxes), and BAFs should be immune to changes in administrations and agendas.
- We have clarified that computing BAFs is a scientific carbon accounting exercise and science provides guidance for identifying capital T, the time when expected changes in carbon stocks (between the reference and the policy scenario) due to increased demand for bioenergy stabilize (or reach a new steady state equilibrium). Furthermore, choosing a time horizon shorter than that supported by science (T) has implications for truncating expected carbon stock changes and could under- or overestimate the value of BAF compared to the level at time T. Additionally, we note (as before) that considering cumulative changes in emissions through T is appropriate as climate science suggests that it is changes in cumulative emissions that affect global mean temperature.
- We have addressed confusion about T and whether or not it should be 100-years by clearly noting that T should be determined with modeling analysis as described above and that we are not recommending a particular value for T. To avoid confusion, we no longer mention 100 years in the text and in certain figures.
- We have emphasized that the BAF will differ over time. It could be increasing or decreasing and $BAF_{\Sigma T}$ will be different from BAF_T .

Upon further discussions with Mark Harmon who did a lot of additional analysis, we added a couple of additional points as follows.

- We have defined T as the time where *system-wide* differences in carbon stocks stabilizes. That horizon T should be applied for all feedstocks in a region. We have defined this time horizon T as the point where the “large majority” (>95%) of changes in carbon stocks occur to acknowledge the practical reality of most of the changes.
- We have added a brief discussion on spatial scale of analysis and appropriateness of the landscape view (supported by our recommendation for an integrated modeling approach to determine the BAF).
- Based on simulations conducted by Mark and shown in a new Appendix E we have also stated the BAF appears to be robust to spatial scale and initial conditions since it is the ratio of the *difference* in stocks in two different scenarios to Potential Gross Emissions.
- Appendix E shows the relationship between stand and landscape levels and provides an important insight that the BAF_T and $BAF_{\Sigma T}$ are insensitive to trends that affect both the policy and reference scenarios in the same manner. Mark’s analysis also illustrated the time trend in the estimate of BAF obtained using a landscape scale is very similar to that obtained using a stand level approach. This trend is also relatively invariant to whether the biomass is obtained from old growth forests or a forest managed as a plantation.

We made numerous other edits in response to SAB comments (which may be found posted at [[HYPERLINK](#)

"[https://yosemite.epa.gov/sab/sabproduct.nsf/32ABE92AC616370185257F800076802A/\\$File/QR+members+comments+bio+emissions+032816.pdf](https://yosemite.epa.gov/sab/sabproduct.nsf/32ABE92AC616370185257F800076802A/$File/QR+members+comments+bio+emissions+032816.pdf)"]) however, given the difficulty of reading a track changes file, we did not add margin comments to explain each change. I have attached a clean version and a “track changes” version made by merging our latest file with the file discussed in our last teleconference.

My apologies for the long delay in getting these revisions to you. I would be happy to participate in subgroup calls about these revisions. Thank you for your attention to this.

April 18, 2017

pg. 1

Lead Reviewer Comments on the Biogenic Carbon Emissions Report Revisions

- 1) I find the revised report unresponsive to the issues raised by the SAB. While the report brings forward an accounting framework that would allow the selection of a time frame to be made by policymakers, it does so without retreating from their earlier prescriptive framing. The result is increased confusion and co-mingling of solid science and policy proscription/pronouncements/framing. Please cite statements in the report where you believe the Panel co-mingled science and policy. Where are these statements????? Given that the accounting for biogenic greenhouse gas emissions is heavily influenced by the temporal dimension and there is no scientific basis for selecting one time frame over another (The Panel believes the science points toward selecting a time frame that incorporates all effects over time) independent of a clear statement of the desired goal, the revised report provides little insight into the fundamental science central to the issues being addressed. The report is written as if the only greenhouse gas accounting being done with respect to greenhouse gas emissions across the economy is from biogenic emissions, yet that is certainly not the case. Please cite statements in the report where you believe the Panel has implied the only accounting being done with respect to CO₂ emissions is from biogenic emissions. ????? This is quite puzzling. This is relevant as central to the usefulness of the report is being able to use the science in the context of the larger set of questions being addressed relative to greenhouse gas emissions from a diversity of sources. The temporal considerations vary across these other greenhouse gas emission sources/decisions as well. If one extends the logic in the report to the treatment of time and assumptions of equilibrium to all emissions sources it leads to illogical conclusions. Please be specific. ????? We cannot follow your train of logic here. This variation is evident even among biogenic feedstocks, with mill residues having a very different temporal dimension than southern forest harvesting residues and again different from residues in the northwest where standard practices is to burn a lot of this material. Yes, these feedstocks have different temporal profiles and the different temporal profiles would be accounted for in the anticipated baseline approach that we have supported.
- 2) Bottom line I do not think the current report advances our understanding of the fundamental science and in fact confuses things to a degree that I could not support approving the report. I do not know the options for how to move forward, but this revised draft falls well short of addressing the concerns the SAB raised the better part of a year ago with the subcommittee.

2) As noted in my comments on the report from last week, I was concerned that the updates to the Biogenic Carbon report would not satisfy at least some people on the SAB.

During our group call, we had all discussed edits that would emphasize that a BAF could be assessed at any time period t , and that the BAF would differ depending on the selected time period. As noted by Bill below, this implies (in general) that biogenic carbon can be a net source of CO₂ in the short run and potentially neutral in the long-run. Within that context, one could also note that “long run” BAFs that capture all (or most) positive and negative effects would likely be most relevant for long-run climate changes, but that “shorter-run” BAFs could be relevant for other purposes (or something like that – as you know I’m not a climate expert). We do not have a scientific rationale to support the shorter-run

BAFs. The scientific rationale for supporting the cumulative BAF is that it incorporates all effects over time. The Panel did not think it scientific to ignore future effects thus it supported a cumulative BAF.

I'm not as concerned about this issue as others on the SAB, and am more amenable to the approach taken by the panel. Nonetheless, as Bill notes below, the updated report does still retain aspects that are likely to be objectionable to some on the SAB. For example, the report still strongly argues that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and negative effects occur. It seems as if the panel is fairly adamant about supporting this "long run" BAF—and this is the very issue that is a problem for others on the SAB. I'm not sure how to get beyond this impasse. Yes, the Panel is adamant about this point and yes, it is the source of disagreement with some of our SAB vetters.

I've viewed my primary role in this quality review as trying to find some compromise or middle-ground that will satisfy both the panel and others on the SAB, and I'm still hopeful that this can be achieved. But I'm not sure the best way forward from here.

April 18, 2017

pg. 2

3) I am most unhappy with the current, revised version of the Biogenic Carbon Report. There have been some "band-aid" fixes to the earlier version, but this revision (at best) muddles the issue of the time frame. On the one hand, it says that time frame is a policy issue (not a science issue) but on the other hand it perpetuates the use of a 100-year time frame, which is said to represent "equilibrium" conditions. With respect to the optimal time path of emissions mitigation over time for all greenhouse gases, the choice of intertemporal priorities is a policy issue and policy tools like carbon taxes, cap and trade, technology subsidies, etc. can be ratcheted up or down depending on one's priorities. The time frame for calculating a BAF is a different matter. It is concerned only with adjusting the BAF for biogenic sources so that it accounts for (1) alternate fates of biogenic materials and (2) sequestration associated with growing trees and crops. The BAF is designed to compare tons of carbon emitted by biogenic sources to carbon emitted by fossil fuels. On this narrow subject, the Panel supported a time frame that incorporates all effects over time. Truncating carbon stock changes before they take place did not

The use of biogenic carbon in stationary sources is a hot issue, both in Europe and the U.S. I was expecting that this report would deliver a clear and concise message showing that such carbon is a net source of CO₂ to the atmosphere in the short run and potentially neutral in the long-run. The ecological-economic modeling does not necessarily support this prediction. Unfortunately, this revision does not deliver that message correctly, nor in a form that can be easily understood by even the interested reader.

At this point, I am not sure what course of action is best, but I will argue that this report should not be delivered to the administrator as representing the SAB.

4) Attached please find a copy of the Biogenic Carbon report with a few minor comments (added in the margin). I don't have any major concerns, although I do wonder whether the changes will satisfy some on the SAB who were strongly pushing for a report that did not specify that a long time frame should be used for BAF calculations. The current report does seem to "double down" on the argument that the appropriate time frame to calculate BAFs is the time frame over which all (or most) positive and

negative effects occur. I agree with this argument, and think that the report is correct in this regard. However, I wonder whether it will satisfy some on the SAB.

My primary substantive question relates to BAFs and feedstocks – see my comment on the response to charge question 1(a). Specifically, the report indicates that for certain types of biomass such as agricultural crops, the time horizon over which all positive/negative carbon effects might occur is likely to be short, while for others (forests) it is likely to be longer. Doesn't that imply that the temporal scale for scientific consideration of carbon stock changes is feedstock dependent? We are saying that the T should not vary across feedstocks. However, with the same T, the BAF can and should vary across feedstocks. However, in the response to charge question 1(a), the statement is made that the BAF should NOT be feedstock dependent. What am I missing? Perhaps this seeming discrepancy could be clarified somewhere. For example, if you are only using corn stover as biomass, wouldn't the effective BAF be different than if you were only using hardwood as biomass (because all the positive and negative effects of using corn stover at t=0 would stabilize much sooner...)? My guess is that this can probably be clarified with a few sentences somewhere.

Finally, please note that the report does still contain a reference to the 100-year time frame (page 6 in the version with changes tracked): "Climate focused studies conclude that it is cumulative emissions over roughly a 100-year period that determine the climate response and that different emissions pathways with the same cumulative emissions are likely to produce to a similar global temperature response." Note that no citations are provided to these studies. The SAB Staff Office (unfortunately) has a policy against citations in an Executive Summary but there are two studies showing this. Allen, et. al. 2009. Warming Caused by Cumulative Carbon Emissions toward the Trillionth Tonne. *Nature*, 1163-1166 and Matthews, et. al. 2009. The Proportionality of Global Warming to Cumulative Carbon Emissions. *Nature*. 829-832. We can add back the references. I suggest that if you wish to include this, then references to these studies should be included to bolster the claim. However, I'm not sure why this sentence needs to be included at all. Why not drop it? It seems that any mention of a 100-year time frame – even an indirect one such as this – is likely to draw the ire of some SAB members. Not sure that's a good reason to exclude science. It's fine with me to include this statement (as long as appropriate citations are provided) – however, it might cause unnecessary consternation among some on the SAB.

April 18, 2017

pg. 3

Other than that, all of my comments are quite minor. There are a number of typos in the report (I have identified a number of them). I'm sure these will be ironed out in the final editing process.

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April 18, 2017

Other than that, all of my comments are quite minor. There are a number of typos in the report (I have identified a number of them). I'm sure these will be ironed out in the final editing process.

Dear Panel,

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- We have clarified that it is important to distinguish science from policy, and BAFs should be science-based and unaffected by policy goals. Policy goals should instead be reflected in the stringency of policies (e.g., emissions caps, emissions standards), and BAFs should be immune to changes in administrations and agendas.
- We have clarified that computing BAFs is a scientific carbon accounting exercise and science provides guidance for identifying capital T, the time horizon when expected changes in carbon stocks due to increased demand for bioenergy stabilize at zero. Furthermore, choosing a time horizon different from what science supports (T) has implications in truncating expected carbon stock changes, and accounting for all future carbon stock changes through T is appropriate as climate science suggests that cumulative carbon stock changes are what determine global mean temperature.
- We have addressed confusion about T and 100-years by clearly noting that T should be determined with modeling analysis and that we are not recommending a particular T at this point. To avoid confusion, we have deleted mention of 100 years in the text and in certain figures.
- We have emphasized that the BAF will differ over time. It could be increasing or decreasing and $BAF_{\Sigma T}$ will be different from BAF_T .
- We have stated the BAF appears to be robust to scale and initial conditions since it is the ratio of the *difference* in stocks in two different scenarios to Potential Gross Emissions.

I don't think any of these things are new to the Panel or depart from our previous consensus. Upon further discussions with Mark, we added a couple of twists that are "new" so I'm listing them below as follows.

- We have defined T as the time where *system-wide* differences in carbon stocks stabilizes. That horizon T should be applied for all feedstocks in a region. We have also defined the time horizon T as the point where the "large majority" (>95%) of effects occur to acknowledge the practical reality of most of the changes.
- We have stated that assessments of biogenic carbon in the literature have varied with the choice of spatial scale and initial conditions.
- We have added Appendix E on the relationship between stand and landscape levels to underscore that cumulative BAFs are insensitive to trends that affect both the policy and reference scenarios in the same manner. Mark's analysis also illustrated the time trend in the estimate of BAF obtained using a landscape scale is very similar to that obtained using a stand

level approach. This trend is also relatively invariant to whether the biomass is obtained from old growth forests or a forest managed as a plantation.

I would like your feedback on these revisions by _____(insert date). Please send me any comments by email. We can hold some subgroup calls to trouble shoot any issues that may arise. As always, if I do not hear from you by _____, I will assume we have your approval. Once we have a draft to forward to the SAB vetters, I will let you know. The chartered SAB will review our draft in a public teleconference yet to be scheduled.

I have attached a clean version and a “track changes” version made by merging our latest file with the file discussed in our October 12, 2016 teleconference. There are numerous minor edits we made in response to SAB vetters’ comments but we did not add margin comments to explain each change because it is already difficult enough to read.

My apologies for the long delay in getting these revisions to you and thank you for your attention to this.

Message

From: Stallworth, Holly [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C6FCE42405914FDE80883507EA708E7F-STALLWORTH, HOLLY]
Sent: 9/7/2017 3:22:11 PM
To: Zarba, Christopher [Zarba.Christopher@epa.gov]; Shallal, Suhair [Shallal.Suhair@epa.gov]
Subject: RE: First Cut
Attachments: Biogenic Carbon_HS.docx

Ex. 5 Deliberative Process (DP)

From: Zarba, Christopher
Sent: Wednesday, September 6, 2017 4:52 PM
To: Stallworth, Holly <Stallworth.Holly@epa.gov>; Shallal, Suhair <Shallal.Suhair@epa.gov>
Subject: First Cut

I will keep working on it but there should be enough here to give you something to work from.

Thanks.

Christopher S. Zarba

US EPA Science Advisory Board

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